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# THE GAS JOURNAL

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## A Glance at the Contents—

**Oil Refining.**

The Scottish Junior Gas Association recently had the opportunity of inspecting the Grangemouth Refinery of Scottish Oils, Ltd., where cargoes are regularly handled at the rate of 400 tons per hour. [p. 227.]

**Mr. F. J. West in Hong Kong.**

Mr. F. J. West is now on his second world tour, and we are able to reproduce from "West's Gas" to-day his own description of his visit to the beautiful island of Hong Kong, together with an aerial photograph of the city itself, which truly presents a dazzling spectacle. [p. 217.]

**National Gas Council.**

A report appears of this month's meeting of the Executive Board of the National Gas Council, when the following matters were discussed: Town and Country Planning Bill; London Passenger Transport Bill; Coal Mines Act; Safety Rules for Chemical Works; and the Rating and Valuation Act. [p. 215.]

**How Steel Tubes are Made.**

On April 9 the Western Junior Gas Association visited the works of the British Mannesmann Tube Company, Ltd., at Newport, and were able to see the plant which manufactures steel tubes. The works comprise two weldless steel tube mills, finishing department, machine shops, lap-welded steel pipe department of six units, and power plant, and cover an area of 100 acres. [p. 222.]

**Paints and Oils.**

An interesting paper on this subject, which was followed by a good discussion, was read by Mr. W. A. Alexander, of Messrs. Gemmell & Thin, at a meeting of the Scottish Junior Gas Association (Eastern District). "There is no doubt," said the author, "that a tremendous amount of money is wasted in attempting to protect ironwork—wasted because the primary painting is inefficiently carried out. . . . The first coating is of paramount importance. The iron must be clean and dry before painting; any rust already formed should be removed by scouring with wire brushes. Sometimes dilute hydrochloric acid is used for this purpose, but this is a dangerous practice, as, unless every trace of acid be washed away, corrosion will certainly follow. The faulty drying of the surface constitutes one of the chief obstacles in the path of successful protection." [p. 223.]

**South Metropolitan Stand at the B.I.F.**

Reproduced to-day from the "Co-Partnership Journal" of the South Metropolitan Gas Company is a photograph and description of the Company's very ingenious display at the London Section of the British Industries Fair at Olympia last February. [p. 216.]

**Lighting of Hull Streets.**

Arising out of the decision of the Hull Corporation to adopt electricity as the medium of public lighting throughout the city, an inquiry was held at the Guildhall last week by Mr. G. H. Thiselton Dyer, an Inspector of the Ministry of Health, into the application for sanction to borrow £65,566, the estimated expenditure involved. [p. 212.]

**Houses to be Cooled by Gas.**

Following over two years' preliminary research and development work by the American Gas Association in the application of gas to house cooling and summer air conditioning, the work has advanced to the point where three practical installations will be made and operated under practical test conditions through the coming season. This announcement, which was made by Mr. F. J. Routledge, Chairman of the Committee on Industrial Gas Research of the American Gas Association, indicates that the most important milestones in recent years in the development of gas utilization have been reached. [p. 217.]

**Value of Statistics.**

In his Presidential Address to the Australian Gas Institute, Mr. H. Tindale, of the Australian Gas Light Company, said that if the Gas Industry is to keep pace with the development which is taking place in the commercial world it must recognize the importance of the statistical methods of analysis. "Hitherto," he remarked, "we have been too busy saving a few pounds in the cost of manufacture, and obtaining a few decimals of improvement in the efficiency of our process, and have overlooked the far greater benefits which would accrue by reductions in overhead and capital charges, as the result of concentrating our energies on securing increased outputs of gas. . . . We still hear the anachronism that profits are made in the retort house. It would be truer to say that *products* are made in the retort house, but *profits* are made in the sales department, for, if our products are not sold, there can be no profits." [p. 219.]

# EDITORIAL NOTES

## *Be Ready*

ON more than one occasion lately, we have urged gas undertakings to be prepared for the better times which it is reasonable to hope are in store for the country, if only because conditions have fallen so low in some directions that they cannot well fall lower. There is certainly a more hopeful feeling about, though so far material evidence of improvement is by no means plentiful. Still, here and there, encouraging signs emerge, and it may well be that these are heralds of an approaching turn of the tide. One cheering announcement made by a correspondent to the "Financial Times" may be cited: "A rush of orders from abroad has caused a Bradford firm of mohair and alpaca manufacturers to sign on between 200 and 300 extra hands. The staff has been almost doubled, and a night shift is to be arranged. Both shifts will be on full time."

The main hope, however—indeed, it is the only real hope—of a big industrial revival in this country must lie in the direction of reduced costs of production; and it is here that the Gas Industry may be able to help. Cheap heat and power are important items in numberless industrial processes, and those undertakings will progress most which do most to assist consumers in this way. That our industrial future lies in reducing costs of production is clear from the finding of the Cotton Mission which has just returned from the Far East: "Unless radical changes are made, there is no hope of Lancashire increasing her trade in the markets of the East. Indeed, until she can offer her goods at competitive prices she will continue to lose ground. A grave responsibility rests on all in the industry. Lancashire is faced with the greatest crisis in her history. Can she rise to the occasion and with a united effort win back her trade? We are confident she can if she will."

Here is both a warning and an inspiration. The watchword of all, it seems, must be "Reduced costs of production." Where more modern plant or increased manufacturing capacity is likely to bring about the necessary result, now is a favourable time to mature such schemes, and it will enable the Industry to "Be ready."

## *On Behalf of Electricity*

AN appeal to electrical undertakers to be ready for the trade boom when it comes has just been made by Mr. Herbert Morrison, the Minister of Transport, who has included in his campaign on behalf of electricity a speech at Bristol. What he said to the industry which he has made particularly his care is very much what we have said in the above article to the Gas Industry—namely, that "it would be a disastrous economic policy if the electricity industry did nothing to be ready for the expansion in trade which would surely come. Economic preparedness was particularly applicable to the electricity industry. The provision of electrical energy could not expand in a day, and it was the duty of those responsible for this industry to expand to-day so as to be ready for the much heavier demands which would certainly arise in the years immediately ahead." Why in the world Mr. Morrison could not include gas as well as electricity in what he had to say, we do not know. Economic preparedness is no more applicable to electricity than it is to gas. But there it is. Mr. Morrison throws all the prestige arising from his official position into the scales on behalf of electricity, while gas is left to "paddle its own canoe."

As a matter of general policy, however, this attitude has long ceased to be a novelty, and it is in details of Mr. Morrison's argument that we are for the moment more particularly interested. In urging gas undertakings to "Be ready," we had in mind the provision, where needed, of more efficient or more extensive manufacturing plant, and the adoption of any other methods likely to result in more advantageous supplies of gas to industry. This is real economic preparedness. But, Mr. Morrison's immediate purpose was to appeal to his audience to make a start at once in speeding up transmission and distribution development in advance of the normal programme; and though it may be, as he urged, "the duty of undertakings to have regard to the great national need for stimulating the demand for labour and for providing increased employment in the many industries directly and indirectly affected by electrical development," this may differ from economic preparedness.

Stimulation of consumption is also necessary, and Mr. Morrison, after exhorting those present at the meeting (representatives of the electricity undertakings in the South-West of England and South Wales) to have as much faith in their industry as he himself has, proceeded to deal with this aspect of the matter. He advocated, with the Commissioners, the adoption, where they do not already exist, of schemes of assisted wiring and of hiring or hire-purchase of apparatus; the setting up of showrooms, and of active publicity campaigns; and the fixing of a reasonable two-part tariff with the lowest possible rate per unit, so as to encourage both existing and new consumers to make the fullest possible use of electricity for all domestic purposes. "Go out for the full domestic load, and not merely the lighting load," he advised. Another suggestion was that somebody in the supply undertaking should be available as a free consulting engineer to all classes of consumers.

Once more we glance at the "Financial Times," and find it stated (April 16): "Impetus will probably be given to the electrical industry by a development for which Mr. J. Gibson Jarvie, Chairman of United Dominions Trust, is responsible. The long-term credit sales and distribution scheme which, with the co-operation of the leading manufacturers, he applied to motor vehicles and all kinds of engineering plant, has now been adapted to electrical installations. The full range of the industry comes within its scope, from a small private dwelling-house, with its lights and domestic appliances, to a large factory. Under the scheme, the electricity user pays for his installation on equitable terms over an agreed period, while the contractor, who receives full payment immediately, is able to make fresh efforts to capture the extensive business opened up by the grid scheme."

These are suggested lines of development which the Gas Industry may bear in mind.

## *Statistics to the Fore*

THE following quotation from a bulletin issued by the Gas Companies' Association of Australia is referred to by Mr. H. Tindale, of the Australian Gas Light Company, in his Presidential Address to the Australian Gas Institute, of an extract from which we begin publication to-day: "We still hear that anachronism that profits are made in the retort house. It would be truer to say that *products* are made in the retort house, but *profits* are made in the sales department, for, if our products are not sold, there can be no profits." And, says Mr. Tindale, the competition with which the Australian Gas Industry is faced can be successfully fought only by investigation, research, and analysis of selling methods, all involving a more extensive use of statistics, which require those methods peculiar to the collection, tabulation, and analysis of quantitative data. Mr. Tindale's address is an object lesson in the application of statistics; and provided that too many generalizations are not drawn, there can be no doubt that the method is a good one. We have certainly found this out in Great Britain—

in such matters as a census of consumers' appliances, for example.

Australia, as our readers well know, is suffering from grave industrial depression; but we are entirely in agreement with Mr. Tindale that the present lull in business provides a golden opportunity for building up efficient selling organizations, carrying out investigations into possible and probable future markets, and mapping out a plan of campaign with the object of immediately securing the new business which will be offering as soon as better days eventuate. In this connection Mr. Tindale makes several suggestions. He thinks that a study of the Education Scheme of the Institution of Gas Engineers would repay the Australian Gas Institute, who might then formulate something on similar lines; that propaganda should be better directed to attract people whose incomes are below £300 a year (who constitute 90 p.ct. of the breadwinners in Australia); that, as in England, reform in gas charges is necessary; and that gas should be charged for by the unit of 3412 B.Th.U., because " there is nothing which causes more misunderstanding by the public than the disparity between the two units of sale adopted by the gas and electricity industry."

Mr. Tindale's address is a broad survey of current conditions of the Australian Gas Industry, and, throughout, this survey is flavoured by statistics and their implication. One of the tables of statistics is both illuminating and significant—it is a comparison of the capital employed in the largest electricity and gas undertakings in State or capital cities of Australia. With electricity, the capital employed per therm is, at its maximum, £2 2s., and at its minimum 6s. 2d. (Tasmania; hydro-electricity). The corresponding figures for gas are 6s. and 3s. 1d. As a percentage of revenue, the capital charges for electricity are 75·9 (maximum) and 46·3 (minimum); the corresponding figures for gas are 35·2 (maximum) and 22·1 (minimum). In view of these figures, Mr. Tindale says that it will be interesting to see how the electricity undertakings will fare as the result of the reduced demand for energy, which is being experienced to-day, owing to the current financial depression. Since they have been hitherto operating at maximum efficiency, will they find it necessary to increase their rates for energy to meet their proportionately increased capital charges, or will they rely on Government and municipal taxes to make up deficiencies? In any event the Gas Industry has no cause for depression when it sees the capital employed per unit of electric current constantly increase.

The incidence of the distribution costs of electricity supply is, of course, of major import. An instance of this was mentioned in our " Electrical " columns last week. Bearing upon this, Mr. Tindale suggests that a new industrial field for the Gas Industry in Australia is the supply of " bottled gas." Inquiries which have been made indicate that an appreciable amount of compressed gas would be used by plumbers and builders on new constructions, if the cost were reasonable. Oxy-coal gas for cutting purposes is in demand both for city and country work. There is also the possibility of using compressed coal gas as a substitute for motor spirit for motor 'buses and heavy transport duty. " Should a demand for compressed gas eventuate, there would then be justification for the supply of ' bottled gas ' for domestic purposes in those districts beyond our line of mains, where the capital required for a reticulation system makes the cost of supplying gas prohibitive. With ' bottled gas ' such districts could be secured for gas, pending the time when they had sufficiently developed to justify connecting up to the main distribution system."

It is obvious from the address that the sale of coke will be a dominating factor in determining future methods of gas production in Australia, more particularly in the capital cities. And in this connection we think that statistics have adversely affected Mr. Tindale's viewpoint. He says: " At the existing rate of decrease in the sales of coke, the demand for that material five years hence will be about 20 p.ct. less than now obtaining in the capital cities." He then goes on to discuss how to modify conditions of gas manufacture to meet this decline in coke sales, suggesting the utilization of shale. His remarks about this are certainly most interesting, but we suggest that, had he forgotten graphs and figures for a moment and concentrated his observations on constructive criticism on the manufacture of a good high-temperature smokeless fuel, and on its effective sale (it can be sold), his address would have gained in force. Statistics, after all, have one grave fault. They are apt to make one forget the saying of one of the most famous men the world has ever known: " Circumstances? I make circumstances."

## *Paint Wisely*

LATELY we have heard a good deal about corrosion of gas plant underground—mains and services—but, apart from an occasional reference, all too little about corrosion of plant above ground. It is obvious that, unless care is exercised, this corrosion is a very expensive item, but it cannot be said that in all places continuous and effective effort is directed to preserving iron and steel structures. For this reason, nothing but good can arise from reading the paper on " Paints and Oils " by Mr. W. A. Alexander and also the discussion on it—particularly the remarks of Mr. J. W. Napier, of Alloa. The paper was read to the Scottish Junior Gas Association (Eastern District) and is published in our issue to-day.

There are two important points about painting iron work and steelwork to prevent corroding influences: The paint must be suitable, and it must be properly applied. And it is certain that first cost either of the paint or of its application ought not to be the determining factor; there is every justification for paying high prices for good paint. This has been the policy of Mr. Napier for many years; and he called attention to the fact that, because he was careful in regard to the selection of paint and to the first coating, structures which he had painted seventeen years ago are in just as good condition to-day. He speaks highly of the virtues of paints with aluminium or graphite bases for affording protection against chemical attack as distinct from ordinary atmospheric corrosion, and, for coating gasholders he pins his faith to " grease paint," which, because it does not dry, does not permit percolation of water. The essence of Mr. Napier's remarks is, Look to quality rather than first cost; it is a business proposition. Excellent paints of what may be termed the ordinary class are available to-day, carefully manufactured; and great developments have been made lately in the production of what one might call extraordinary paints. An example of the latter was referred to in the " JOURNAL " for March 11 last, for which several claims are made. This material is a " liquefied lead," with an oil conveyor. The lead, we understand, forms a positive amalgamation with the iron or steel, which impregnation is impervious to the action of rust.

We mention this material not only because it is interesting in itself, but also because its effectiveness lies in its application to a thoroughly dry and clean surface. Thousands of pounds must be lost by the Gas Industry every year in attempting to protect ironwork—wasted because the primary painting is inefficiently carried out. As Mr. Alexander points out, Government authorities of the different countries have long realized the importance attached to the efficient painting of ironwork, and have issued specifications for the paint materials and the methods of their application. But the human factor comes in, and there is a considerable difference between theory and practice. " The faulty drying of the surface constitutes one of the chief obstacles in the path of successful protection, because very few workmen understand the meaning of a dry surface. . . . The film of moisture which is deposited on most bodies in damp air very often passes unobserved, but ought to be removed before painting commences. The most efficient way of doing this would seem to be by heating the iron with blowlamps and laying on the first coat while the iron is still warm. This would mean, naturally, that only a small area at a time could be dealt with, and that more time and expense would be involved; yet it would be more or less an initial outlay only, as fewer subsequent coatings would be required." The foregoing is certainly worthy of consideration.

## PERSONAL

Mr. G. J. Mear, for many years Secretary to the Wolstanton Gas Undertaking, recently retired on superannuation; and on Thursday last high tribute was paid to his services by members of the Wolstanton Urban Council and his colleagues in all departments of the Gas Undertaking. They presented him with a handsome mahogany china cabinet. It was stated that every one of the staff and workmen had subscribed to the presentation fund. Mr. Mear, in reply, said he looked upon that gathering as a fitting climax to a life of endeavour for the public good.

Mr. Laurence R. Hislop, late Assistant Gas Manager to the Dundee Corporation, was given a presentation by members of the staff of the Dundee Gas-Works at a social in the Queen's Hotel on April 17. There was a large gathering. Mr. Hislop was presented with a wallet and notes on behalf of the gasworkers and members of the staff present. Mr. Hislop, in reply, said the fact that they had appreciated his association with them was a most valuable thing to him. He returned thanks for the gift and also for good wishes expressed for his future.

Mr. Walter T. Dunn, M.I.Mech.E., who has been for some years a Member of the British Section of the International Association of Journalists, has recently been admitted a Member of the Institute of Journalists, by the Council of that body, on the absorption of the Section into the Institute.

## CORRESPONDENCE

### *Gas and Foreign Competition*

Sir,—The issue of your valuable paper dated March 4, 1931, contains an interesting article on "The Economic Position of the Gas Industry," in which it is stated that the Gas Industry "has to meet no foreign competition." Later in the article, bye-products are mentioned. Surely these have to face foreign competition, and it seems just that the statement of your contributor should not pass unchallenged.

George E. H. Keillor.

*Colombo Gas and Water Company, Ltd.,*
*Colombo, March* 30, 1931.

## Forthcoming Engagements.

**April 24.**—B.C.G.A.—Annual meeting of Gas Salesmen's Circles ("Gas Salesmen's Day"), in London.

**April 24.**—London and Southern District Junior Gas Association.—Meeting at the Westminster Technical Institute. Mr. J. G. Clark on "Gas Lighting."

**April 30.**—B.C.G.A.—Scottish District Conference at Galashiels.

**April 30.**—Southern Association (Eastern District).—Meeting at 28, Grosvenor Gardens, S.W. 1.

**May 1.**—London and Southern District Junior Gas Association.—Annual Meeting at the Westminster Technical Institute.

**May 1.**—North of England Gas Managers' Association.—Meeting in Newcastle.

**May 2.**—Wales and Monmouthshire Juniors.—Annual Meeting in Cardiff.

**May 2.**—Western Juniors.—Annual Meeting at Frome.

**May 7.**—B.C.G.A. Midlands District Conference at Shrewsbury.

**May 14 and 15.**—Eastern Counties Gas Managers' Association.—Spring Meeting at Wisbech.

**May 15.**—Southern Association.—Visit to the works of the Tottenham and District Gas Company.

**May 19.**—Society of British Gas Industries.—Annual General Meeting in London, under the Presidency of the Right Hon. Lord Eustace Percy, M.P.

**May 20.**—British Commercial Gas Association.—Meeting of General Committee, 2.30 p.m.

**May 21.**—Midland Association.—Meeting at Wellington, Salop.

**May 21.**—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—Meeting at Cardiff.

**May 28.**—Southern Association (Eastern District).—Meeting at 28, Grosvenor Gardens, S.W. 1.

**June 2-4.**—Institution of Gas Engineers.—London Conference.

**June 3.**—Association of Statutory Inspectors of Gas Meters.—Annual meeting at the County Hall, Westminster Bridge, 10.15.

**June 30.**—National Gas Council.—Thirteenth Annual General Meeting.

**Sept. 28-30.**—British Commercial Gas Association.—Annual Conference at Exeter.

**Oct. 27-28.**—Institution of Gas Engineers.—Autumnal Research Meeting.

# THE NEWS OF THE WEEK

**An Outbreak of Shop Window Slashing** in Bradford, recently, affected particularly six extensive shops with large windows in Darley Street, one of which was the Corporation Gas Showroom. At the Gas Showroom there were six horizontal slashes, about 2 ft. from the ground, on five of the big windows. One of the slashes was a yard in length.

**Evening Star Lodge, No. 1719.**—The Secretary informs us that the regular meeting of the Lodge, which would normally take place on May 27, has been postponed until June 1. This is to give the brethren the opportunity of welcoming Masonic members of the Institution of Gas Engineers who may be in London for the Annual Meeting of that body.

**Association of Statutory Inspectors of Gas Meters.**—By permission of the London County Council, the Annual General Meeting of the Association will be held in the County Hall, Westminster Bridge, on Wednesday, June 3. The chair will be taken by the President, Mr. H. N. Barrow, J.P. (Chairman of the Manchester Justices' Gas Meter Testing Committee), at 10.15 a.m., when the annual report of the Council and other business of the Association will be dealt with. The Council of the Association invite the attendance of representatives of authorities administering the Gas Measures Acts, together with their inspectors.

**The Pontefract Rotary Club** was addressed last week by Mr. B. Hudson, Engineer and Manager to the Pontefract Gas Department, who took as his subject "The Carbonization of Coal, and some observations on the Pontefract Gas Department." The address was very well received by the members of the Club.

**Bradford Gas Department's Showrooms** are participating in an attractive collective advertising scheme organized by shopkeepers of Darley Street, North Parade, and Manningham Lane, and which includes the issue of a monthly magazine known as "The Bradford Shopper." The Gas Department have taken in this magazine two full-page advertisements, one featuring Radiation gas fires, and the other incorporating a coupon for a free gas cookery recipe book.

**Oswestry Gaslight and Coke Company** have reduced the price of gas. Consumers up to 5000 c.ft. per quarter will still pay at the rate of 5s. per 1000 c.ft., but after that consumption there is a reduction of 5d. per 1000 c.ft. up to 20,000 c.ft. per quarter, and a further reduction for larger consumptions. At present, the Company allow a discount of 7½ p.ct. for prompt payment. In future, the discount will be at the rate of only 5 p.ct. Slot meter users are to receive a bonus of 10 p.ct. on amounts up to £2, and a larger bonus on bigger amounts.

## Gas Salesmen's Day.

### Programme.

The following are the arrangements which have been made for the Eighth Annual Meeting of members of the British Commercial Gas Association's Gas Salesmen's Circles, to be held on Friday, April 24 next, at the Caxton Hall, Westminster:

MORNING.

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| 10.30 a.m. | Assembly of Members. |
| 10.45 a.m. | Welcome by the President of the B.C.G.A., Mr. John E. Daw, J.P. |
| 10.50 a.m. to 11.15 a.m. | Brief Statements by the Chairmen of the respective Circles on the Work of the Session. |
| 11.15 a.m. | Presentation to the Executive Chairman of the B.C.G.A., Sir Francis Goodenough, C.B.E., by the President on behalf of the Members of the Salesmen's Circles. |
| 11.25 a.m. | Address by Mr. Harold Whitehead on the B.C.G.A. Scheme of Education and Training for Gas Salesmen, followed by a discussion in which salesmen present are invited to raise questions on the Scheme. |
| 12.45 p.m. | Adjournment. |
| 1. 0 p.m. | Luncheon. |

In the afternoon the members will make an official visit to the Ideal Home Exhibition at Olympia, commencing at 2.30 p.m.

## Gas Wins at Bradford.

The long controversy in Bradford as to whether the main roads—other than electric tramway routes—shall be lighted by gas or electricity would seem at last to have come to an end by the Special Joint Committee confirming its former recommendation that certain secondary roads and motor 'bus routes, totalling some 38 miles, shall be lighted by gas. This was the recommendation made some time ago, after an exhaustive comparative test of the two systems in operation, but the Electricity Committee asked for the subject to be re-opened on the ground that they had some new evidence in support of electric lighting.

The advocates of gas contended that in its modern equipment it is equally efficient as electricity in street lighting and considerably less costly. The Special Committee have again endorsed that view, and it is expected that the work of lighting these roads will now be put definitely into the hands of the Gas Committee, who also light practically all the private and side streets of the city and suburbs. The tramways routes were changed over entirely to electric lighting a year or two ago, the tramways overhead equipment being utilized in this service.

## F.B.I. Mission to Canada.

The Federation of British Industries' Mission to Canada, the members of which are Col. Sir James Lithgow, Bart., President of the Federation, Sir Arthur Duckham, G.B.E., K.C.B., Deputy-President-Elect of the Federation, and Mr. Moir Mackenzie, left on April 18 in the "Empress of France," sailing direct to Quebec.

The Mission is going out at the invitation of Mr. Stevens, Minister of Trade and Commerce for the Dominion, and has been given great assistance in making its plans by the Canadian Government, through the offices of the Right Hon. G. H. Ferguson, High Commissioner for Canada in London.

While various Government Trade Missions have been despatched from this country to different parts of the world during the last few years, this particular Mission is unique in that it is the first of its kind to be despatched by the representative body of British industry in Great Britain. The object of the Mission is to formulate means of increasing trade with the Dominions.

## Nottingham Gas Frauds.

The question of officials of the Nottingham Corporation receiving presents in connection with these frauds was discussed at considerable length at a meeting of the City Council on Monday, April 13, when the General Purposes Committee, which is composed of the Chairmen and Vice-Chairmen of the various other Committees of the Corporation, was instructed to make further inquiries into matters affecting officials and employees in the Gas Department. The Gas Committee was instructed to make such arrangements forthwith as may be necessary to bring into effect the re-organization of the Department on the general lines recommended by the accountants who investigated the whole business.

The assurance was forthcoming in regard to the presents, totalling over £3000, which one of the convicts, Gardner, alleged he had given to various employees, and of which over £800 had been traced by the police as having been paid by him, that there would be no punishment of officials in any way until they had had an opportunity of defending themselves. Sir Bernard Wright, Chairman of the Committee, invited those who had received gifts to communicate with the Town Clerk.

Sir Bernard said he did not suggest that every recipient received what he did with any idea of corruption, because gifts were only too common in many circumstances of life. He took the opportunity of inviting officials and employees of the Corporation who in the last six years had received or had been offered any gift or benefit of any description to take the opportunity of communicating the fact to the Town Clerk. He did not suggest that nothing might happen as a result of the voluntary disclosure.

"Our investigations will continue for some time yet," he continued, "and if we do, as we probably shall, come across cases where this voluntary disclosure has not been taken advantage of, there is not much hope that that man will continue in the services of the Corporation, even if nothing worse happens."

Sir Albert Ball, Chairman of the Gas Committee, took the opportunity of stating the case of the Gas Committee and its Manager, and he gave statistics showing that the Nottingham Gas Undertaking compares most favourably with others in the country. He contended that Nottingham had the best Gas Engineer in England, and that the undertaking could stand proudly on its record. No undertaking, he said, was better managed, and no manager in the country had a better reputation outside Nottingham or was more capable of managing a gas undertaking.

## Victory for Gas Lighting.

The Hampton Court General Purposes Committee have decided to recommend the acceptance of the offer of the Hampton Court Gas Company for lighting the whole of the district by gas.

This decision is the result of a comparative test of gas and electricity in Broad Lane. Councillor March (Chairman of the Committee) explained that the Committee had seen the test lamps that were erected by the Gas Company and the electricity authority in Broad Lane, and it was agreed by a majority that the gas showed a better light than the electricity. Personally, he favoured electricity, but he had to admit that the gas lights were better.

Councillor Vanner said that every member of the Council and the public had had an opportunity of seeing the two systems, and the general opinion was that the gas lamps were superior to the electric. The chief reason was that the diffusion of the gas lamps was greater, while the electric lamps, although giving a brilliant light, were not so penetrating.

## "Power and Fuel Bulletin."

The World Power Conference, recognizing the need for a comprehensive and authoritative survey of current information on power, fuel, and related subjects, has arranged for the publication of the first international bibliography in this field.

The British Section of the "Bulletin" will be published on the 25th of each month. The first number for January, 1931, was published on Feb. 25. The "Bulletin" will aim at providing selective and up-to-date abstracts of books, papers, articles, &c., on Power and Fuel, published in this country and grouped under the following main headings: (*a*) Sources; (*b*) Generation; (*c*) Distribution and Storage; (*d*) Utilization.

Germany, Japan, and the United States of America are preparing similar Bulletins, and it is expected that the other member-countries will do the same. The bibliographies will be in one of the three official languages of the World Power Conference—viz., English, French, or German. The extracts will be indexed in accordance with the Universal Decimal Classification system, which makes it possible to amalgamate into a single index all contributions to the bibliography, irrespective of the source and language employed. The abstracts will be printed on one side of the paper only, and will be suitable for mounting on 5 in. by 3 in. cards. Alternatively, they can be bound annually and an index and title sheet will be provided.

The following organizations are co-operating in the compilation of the bibliography: Fuel Research Division, Department of Scientific and Industrial Research; British Chemical Plant Manufacturers' Association; British Electrical and Allied Manufacturers' Association; Institution of Petroleum Technologists; National Federation of Iron

## THE NEWS—*continued.*

and Steel Manufacturers; National Gas Council of Great Britain and Ireland.

The annual subscription is 10s. A copy of an explanatory leaflet, which contains a subscription order form, will be supplied upon request by the Hon. Secretary, British National Committee of the World Power Conference, 63, Lincoln's Inn Fields, London, W.C. 2.

## Lighting of Hull Streets.

### Gas Companies Oppose Electricity Scheme.

Arising out of the decision of the Hull Corporation to adopt electricity as the medium of public lighting throughout the city, an inquiry was held at the Guildhall last week by Mr. G. H. THISELTON DYER, an Inspector of the Ministry of Health, into the application for sanction to borrow £65,566, the estimated expenditure involved.

The Town Clerk, Mr. J. R. Howard Roberts, presented the case for the Corporation, while strong opposition was put forward by the British Gas Light Company and the East Hull Gas Company, who have about 80 p.ct. of the street lighting at the present time. They were represented by Mr. D. C. Baker, barrister, and their case was that under schemes which they had put forward for improved and better gas lighting they could provide an illuminant equal to electricity at a considerably cheaper rate. Opposition was also raised by Councillor T. Hardaker, on economical grounds.

The Town Clerk said there was complete dissatisfaction in the city with the existing conditions of lighting, and the change-over would give the Corporation direct control in one of their own departments.

Cross-examined by Mr. Baker, *Alderman Holwell* (Chairman of the Works Committee) said that he could not say that the Gas Companies had treated the Works Committee generously and given additional lights without making any additional charge. The Companies had the same opportunity as the Electricity Committee to submit proposals for improving the street lighting. The Electricity Committee approached the Works Committee on their own initiative, and it was up to the Companies to do the same. The Works Committee was faced with a resolution by the City Council instructing them to prepare a scheme for the gradual supersession of gas lighting by electricity.

Mr. Baker: Do you think it would be a natural thing for the Gas Companies, of their own volition and without any instructions, to go to the expense of preparing a detailed scheme for the lighting of the city?—I don't see why they could not have done so, in the sense that the East Hull Gas Company, for example, approached us with regard to altering the lighting in Witham.

Mr. Baker: At any rate, no request has been made to the Gas Companies to give demonstrations or submit quotations, and they have been totally ignored?—If you put it that way, yes.

Counsel quoted figures showing that for the first ten years the cost of lighting the British Gas Light Company's area with electricity would be £274,370, while under the Company's proposals it would be £215,050, a saving of £59,320. Counsel next put the figures relating to the East Hull Gas Company's area, which were: Electricity £119,190; gas £107,690, a saving in ten years of £11,500.

Addressing the Inspector, Councillor Hardaker denied that there was any great amount of dissatisfaction in the city with the gas lighting, and said the Gas Companies had proved they could provide an almost equal illuminant to electricity at a cheaper price.

#### SIR FRANCIS GOODENOUGH AND MR. COPP AS WITNESSES.

The first witness called on behalf of the Gas Companies was *Sir Francis Goodenough, C.B.E.* He said that in the areas of the local authorities in London who did not own electrical undertakings there had been no increase in electric light in the last thirty years with the exception of one district. In the city of Westminster, the City of London, and all other areas where the light authority had no interest in the other illuminant there had been no increase in electric light since the days when the flat flame burner was superseded by the incandescent mantle. It used to be said that every gas lamp was as good as a policeman. Electric light was the burglar's friend because of its constant failures.

*Mr. Harold E. Copp,* President of the Institution of Gas Engineers, and Engineer of the Hull Station of the British Gas Light Company, Ltd., admitted the existing installation in Hull was out of date. He said he was prepared to overhaul the installation, and put in the most modern equipment. The Company would carry out any requirements of the Corporation, and would accept a penalty clause with regard to the illuminating power of the lamps.

*Mr. R. Nelson,* Engineer and General Manager of the East Hull Gas Company, gave evidence on similar lines; and *Mr. C. I. Winstone,* London, gave technical evidence.

Mr. Baker stressed the contention that the acceptance of the Companies' offer would result in a saving, in ten years, of between £70,000 and £80,000, and said their answer to the criticisms with regard to the maintenance of the stipulated candle-power was that they had agreed to accept a penalty clause.

The Inspector will report in due course.

## Gas Unit Charging at Hessle.

The Hessle Gas Company, Yorkshire, have announced that until further notice gas will be supplied on the unit method of charging instead of by the therm as heretofore. The latest figures available show the Hessle Company to have some 3360 consumers and a gas make of 73 millions.

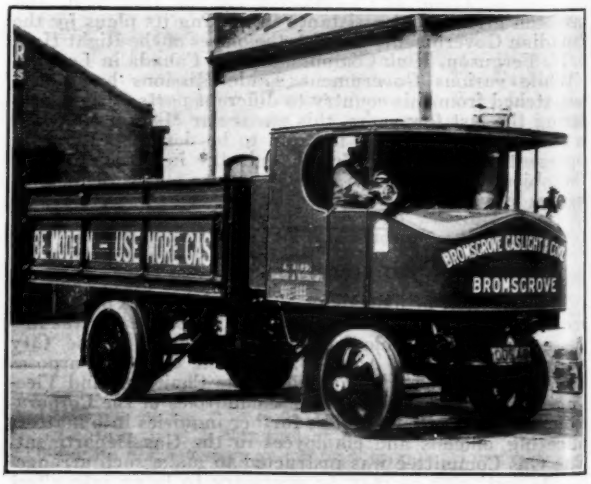
The undertaking has taken as its basis of charge a gas unit of 4000 B.Th.U., and it is pointed out in a notice to consumers that the gas unit thus has a greater heat value than the electrical unit, and that gas thus becomes more directly comparable with electricity in price.

The prices each quarter as from June 30, 1931, until further notice will be in accordance with the following block system:

| For Gas Supplied | Per Gas Unit— In the U.D.C. of Hessle, Parish of Anlaby and City of Hull. | Per Gas Unit— Elsewhere. |
|---|---|---|
| | d. | d. |
| For the first 500 units or part thereof | 0·464 | 0·512 |
| ,, ,, next 500 ,, ,, ,, ,, | 0·440 | 0·488 |
| ,, ,, ,, 750 ,, ,, ,, ,, | 0·420 | 0·468 |
| ,, ,, ,, 750 ,, ,, ,, ,, | 0·400 | 0·448 |
| ,, ,, ,, 1,250 ,, ,, ,, ,, | 0·380 | 0·428 |
| ,, ,, ,, 1,250 ,, ,, ,, ,, | 0·360 | 0·408 |
| ,, ,, ,, 2,500 ,, ,, ,, ,, | 0·340 | 0·388 |
| ,, ,, ,, 2,500 ,, ,, ,, ,, | 0·320 | 0·368 |
| ,, ,, ,, 2,500 ,, ,, ,, ,, | 0·280 | 0·328 |
| ,, ,, ,, 12,500 ,, ,, ,, ,, | 0·240 | 0·288 |

Alternatively, consumers who so desire, may pay the same poundage upon their rateable value as required by the local suppliers of electricity and be charged at ¼d. per gas unit of 4000 B.Th.U., in lieu of ¼d. per unit for electricity. Consumers using a large quantity of gas in low-rated premises would find this an advantageous alternative. Should the block system in any quarter work out cheaper than the rateable value system the consumer will be given the benefit of the block system in such quarter.

Consumers through prepayment meters will be charged at the same rates as ordinary consumers for gas, and hires, and cash received through meters will be placed to their credit.




This "Super-Sentinel" Four-Wheeler with Three-Way Tipping Body just been put into service by the Bromsgrove Gaslight and Coke Company.

*THE NEWS—continued.*

## New Scale of Charges at Dunfermline.

The Town Council of the City and Royal Burgh of Dunfermline at their meeting on April 14 decided upon an entirely new scale of gas charges, designed upon the lines advocated by their Engineer and Manager, Mr. James Campbell in a paper read before the North British Association at their meeting in Dumfries in 1927 [see "JOURNAL" for Sept. 14, 1927, p. 615].

The present prices are as follows:

Consumers by ordinary meter, up to £10 annual value, 3s. 2d. per 1000 c.ft. net.

| | |
|---|---|
| Accounts between £10 and £50 per annum . . | 2½ p.ct. discount |
| ,, ,, £50 ,, £100 ,, . . | 5 ,, |
| ,, ,, £100 ,, £200 ,, . . | 7½ ,, |
| Accounts over £200 per annnm . . . . . | 10 ,, |

Slot meter consumers 5d. per 1000 c.ft. extra, making a price of 3s. 7d. per 1000 c.ft. net for all consumptions.

INDUSTRIAL CONSUMERS.

| | Per 1000 C.Ft. s. | d. |
|---|---|---|
| Up to 50,000 c.ft. per annum . . . . . | 2 | 8 |
| From 50,000 to 100,000 c.ft. per annum . . . . . | 2 | 5 |
| ,, 100,000 ,, 250,000 ,, ,, . . . . . | 2 | 4 |
| Over 250,000 c.ft. per annum . . . . . | 2 | 2 |

These prices are net.

The new scale of prices is as under:

| | Per 1000 C.Ft. s. | d. |
|---|---|---|
| For all consumptions up to 24,000 c.ft. per annum . . . | 3 | 2 |
| ,, ,, between 24,000 and 100,000 per annum | 2 | 10 |
| ,, consumptions ,, 100,000 ,, 500,000 ,, | 2 | 2 |
| ,, ,, ,, 500,000 ,,1,000,000 ,, | 2 | 1 |
| For consumptions over 1,000,000 c.ft. . . . . | 2 | 0 |

These prices are net.

The scale is to be applied quarterly, and will refer to quantities used in one and the same premises; it will come into force on May 16 next.

Under this scheme, there will be no discounts, and no industrial rates, and the price charged will therefore depend entirely upon quantity used, irrespective of whether the gas is used for domestic or industrial purposes. Slot consumers who use over 24,000 c.ft. per annum will benefit according to the scale, and will be in the same position as those who use ordinary meters, except that they will pay 5d. per 1000 c.ft. extra on all consumptions.

According to the "Dundee Advertiser," Councillor Milligan, Convenor of the Gas Committee, stated that the intention of the scheme was to stimulate consumption and to encourage the installation of additional gas appliances, such as fires, &c. Fully 3000 ordinary consumers would pay less for gas under this scheme as their consumption stood at present. They were faced with increasing competition with electricity. They could produce 15 million c.ft. with no additional actual cost.

Mr. Campbell, the Gas Manager, stated that only about 600 small industrial consumers would have to pay more for their gas as the result of the scheme.

## Glasgow Corporation and the Gardner Contract.

At a meeting of the Glasgow Corporation Gas Committee, regarding the agreement between the Corporation and Messrs. Gardner (Collieries), Ltd., the Mount Vernon Colliery Company, Ltd., and the Banknock Coal Company, Ltd., for a supply of gas in bulk from works to be established by the companies in the vicinity of their collieries at Mount Vernon and also at Woodilee Colliery, there was submitted a letter from Mr. John Duncan, stating that as John Gardner (Collieries), Ltd., Banknock Coal Company, Ltd., and Woodilee Coal and Coke Company, Ltd., had gone into liquidation it would be impossible for him as liquidator of these companies to implement the terms of the agreement.

The Committee recommended that the request for an *ex gratia* repayment of the deposit of £5000 be agreed to.

# Ideal Home Exhibition at Olympia

Reference was made on p. 160 of last week's "JOURNAL" to the display of the Parkinson Stove Company, Ltd., at the Ideal Home Exhibition, which is now drawing large crowds to Olympia. In the portion of the well-arranged stand which is illustrated the firm feature their "New Suburbia" cooker, to which particular allusion was made in our notice of the exhibit; while through the doorway can be seen the "Indusa" heater, which also received special mention.

# GAS SERVICE - - -

*Discussed from the viewpoint of the Gas Salesman*

## *Editorial Activities of the B.C.G.A.*

Members of the West Riding Circle, which covers 73 Yorkshire Undertakings, met at Castleford on April 15 to hear a paper by Mrs. M. A. Cloudesley Brereton, Editor of Publications and Consultant to the B.C.G.A., on the Association's activities in advertising. Mr. J. W. Carlton (Shipley) was in the chair at the meeting.

Mrs. Brereton divided the activities of the Editorial Organization into two parts—direct advertising in newspapers and periodicals, and indirect advertising through general propaganda. She pointed out that both are planned to influence and educate public opinion, and that the Gas Industry may justly claim that it has, by its organized advertising of all kinds, done much to change the habits of the whole nation.

Mrs. Brereton took the members of the Circle " behind the scenes," and showed them how an advertising campaign is organized, how newspapers, magazines, trade journals, and so on are chosen, and the care with which the " copy " and illustrations are prepared. Every class of newspaper and magazine received particular attention, so that the proper appeal was given in each advertisement issued. She also indicated the methods adopted in writing leaflets, general literature, and newspaper articles, and showed what happy relations existed between the Editorial Organization and editors of newspapers and magazines.

Mrs. Brereton concluded by inviting discussion on how the Association, and particularly the Editorial Organization, could further help members in their respective areas. Many useful suggestions were forthcoming. A vote of thanks was proposed by Mr. A. Wylie (Sheffield) and seconded by Mr. E. R. B. French (Leeds). The meeting then adjourned for tea at the invitation of the Chairman and Directors of the Castleford and Whitwood Gas Light and Coke Company. The Chairman of the Company, Mr. Cliff, J.P., was present at the meeting and presided at tea, and was supported by some of his fellow Directors.

## *The Gas Industry and the Wasp.*

Another new B.C.G.A. booklet which is good propaganda for the Gas Industry shows how 32 lbs. of coal yield one therm of gas—*and the rest.* It may not be of vast importance, but it will interest many people to know that if they owned a ship which was infested with rats, or a hole in which wasps were multiplying rapidly, they could go to the gas-works for a remedy; that, when they " dip " either their sheep or the posts which support their garden fence, they are probably using something which, together with a therm of gas, had its origin in 32 lbs. of coal carbonized by the Gas Industry. Again, many will be surprised to hear that half-a-million gallons of benzole are used each year for dry cleaning, and that many moulded electrical fittings are made of bakelite which is a condensation product from gas-works phenols. Of course, there are plenty of more important facts and figures in " A Therm of Gas and . . .," but it is sometimes the comparatively trivial which appeals or makes the opening for " talking gas."

## *A Word for the Therm.*

Therms, Therms, Therms. But why Therms and what are Therms? Nobody wants to buy coal because it looks pretty in the cellar or ornamental in the coal scuttle. Nobody wants to buy gas just to fill toy balloons; everybody wants to buy heat—clean, convenient, cheap heat. Nobody cares whether they buy ten *cubic feet* of gas or ten thousand so long as they get enough *heat* for their money to heat the house or the bath water, or cook the dinner. Therefore the gas undertakings charge directly for *heat;* and, moreover, heat which can be brought into action anywhere at a moment's notice and which can be controlled automatically or by hand from near or far.

The above is the opening—and keynote—of a new B.C.G.A. publication, " What a Therm of Gas Will Do," which will be helpful to the gas salesman in many ways. It not only sets out clearly many of the operations which a therm of gas will perform, but explains in simple everyday terms, for the ordinary non-technical man (or woman) just how these operations are effected. It claims, for instance, that a therm will cook 4 dinners for a family of six, explaining at the same time, by means of a diagram, how the oven thermostat functions. It tells us that a therm will boil a mixture containing 50 lbs. sugar, 18 lbs. glucose, and 14 lbs. water in ten minutes, while giving an interesting little dissertation on batteries of gas-heated sugar boilers for sweet making. And so on.

## *Salesmen and Demonstrators.*

A staff of thirty-three women demonstrators, who spend their time visiting consumers in their own homes, is employed by the Gas Light and Coke Company. The number called on last year was 56,074, and out of this number advice was given to 36,994 consumers.

These figures were given in a paper by Miss Ethel Willans, M.B.E., who is Principal of the Company's Women's Advisory Staff, which was read before the London Area Salesmen's Circle last week. Her subject was " Opportunities for Women in the Gas Industry." Incidentally she pointed out many opportunities for gas undertakings to further their own interests by the employment of women in various ways. Miss Willans advocates that every gas showroom should have at least one saleswoman on the staff, who should preferably have had a thorough business training before being allowed to deal with consumers. It is a great advantage, she considers, if the saleswoman has a certain knowledge of cookery, so that she can speak with authority on what the various types of ovens can do. She would extend this training if possible to at any rate some practical knowledge of the usefulness of other appliances, such as irons, washing machines, &c.

The other chief opening that the Industry offers to women is that of demonstrator and advisor—two functions which are combined in one job. This work also calls for very specialized training, and the qualification in Miss Willans' Company is a diploma from a recognized school of cookery, which means three years' training in cookery and its allied subjects, and training in public demonstration work. After the demonstrator has been appointed, further instruction in how to use gas ovens is necessary because, strange as it may seem, a cookery training seldom, if ever, teaches the economic use of a gas oven, and it has now been decided that, before calling upon consumers in their own homes, a demonstrator shall spend a certain period—about two months—in the showrooms, so that she gets the right commercial atmosphere and also a thorough knowledge of appliances.

## *Dealing with Cooker Difficulties.*

The chief function of the woman advisor is the calling on consumers to advise them on matters and difficulties connected with their cookers. This gives them an entry into the house, of which they can then frequently make use in suggesting other appliances, such as irons, fires, or water heating. But the way is not always by any means so smooth as might be expected. For instance, the cook is frequently irate at the idea of anyone attempting to teach her anything in connection with her job, and patience and tact are great assets. The easiest calls are usually those made upon the young married woman, who is often only too glad of any help and advice she can get.

Miss Willans made a plea for sympathetic understanding from the inspectors, who, she thinks, do not always look kindly upon the demonstrators and their suggestions, particularly in little matters of their requests for taps to be eased, and grid shelves adjusted which cannot be moved about in the oven easily. The demonstrator has no desire to cause extra work to the Inspectors' Department. She is only looking at matters from the housewife's point of view, and if the inspector always realized how intensely irritating these small defects are to women who are busy cooking, they would perhaps have more sympathy with the complaints.

## *Hotplate Troubles.*

A demonstrator hears many complaints about the hotplate, said Miss Willans. Housewives object to all the burners being the same size, and also that saucepans still

tend to fall over easily and burn. The saucepans referred to are usually of very thin aluminium and have a very small base, and consumers resent any criticism of their equipment. It is difficult to refute these statements by talking about burner efficiency. Miss Willans' experience shows that housewives do not appreciate this point, and usually say they would rather use more gas than have to buy new saucepans. Miss Willans advocates an alternative hotplate provided with at least one drilled ring burner, or a larger burner of the continental type. She also considers that the indicator on the oven should be easier to read, while in the subsequent discussion it was stated that the reversal of the oven door handle on some makes of cooker is proving extremely irritating to consumers.

### *Technical Training for Demonstrators.*

In the discussion which followed Miss Willans' paper several speakers emphasized the necessity for lady demonstrators to have some technical training, beyond just salesmanship and cookery. It was suggested that they should understand such matters as flame adjustment, and might, indeed, carry about with them a small screwdriver in order to be in a position to remedy minor defects. It transpired that the Women's Advisory Section of the Gas Light and Coke Company have certain technical knowledge, which often saves the fitters a good many visits. They never interfere, however, with the more serious defects. Mr. Becket (the Chairman) remarked that mechanical knowledge is merely a matter of training. Women are just as mechanically minded as men. In proof of this one has only to visit one of the large stove works to find both working side by side on mechanical jobs.

### *Storage Water Heating.*

Particular emphasis was laid by Mr. Becket on the necessity for securing the domestic hot water load by means of thermal storage heaters. Such a load, he said, is not subject to peaks, which are so worrying to gas engineers. Such a load, too, would render profitable large numbers of consumers who are now on the borderline of being unprofitable. The provision of hot water is one of the outstanding services the Gas Industry can render—and one which, up to the present, it has neglected more than any other. The chief point is that the thermal storage system is an automatic one, and there are plenty of people who are prepared to pay a little more for an automatic service. The Gas Light and Coke Company, said Mr. Becket, recently introduced a washing machine, which is a fairly expensive piece of apparatus. Expert salesmen were employed to canvass consumers, and these went out and sold no fewer than two hundred of these machines, costing anything from £10 to £15 each—and these not to the well-to-do consumers. The apparatus, in fact, appealed to the class of consumers who do their washing at home. If these will buy expensive washing machines, surely one can approach the better-class consumers and sell them automatic water heating systems.

### *In the Land of Signs.*

We are all familiar with the blue or white enamel sign now appearing on many apartment buildings, informing those who may read it that " this particular building is equipped with mechanical refrigeration." A similar sign, advertising that the building is equipped with automatic gas hot water service, has been well received by many building owners.—(" Gas Age-Record.")

# National Gas Council

## Meeting of Central Executive Board

A Meeting of the Central Executive Board was held at 28, Grosvenor Gardens, London, S.W. 1, on Tuesday, April 14—Sir DAVID MILNE-WATSON, LL.D., D.L., in the chair.

#### NOMINATION FOR HON. MEMBERSHIP.

A resolution was passed nominating the Chairman of the Scottish District Executive Board, Sir William Whyte, O.B.E., J.P., for Hon. Membership of the Council, and a resolution will come up before the annual meeting on June 30.

#### TOWN AND COUNTRY PLANNING BILL.

It was reported that this Bill sought to authorize the making of schemes in respect of the development and planning of land, whether urban or rural, and to provide for the protection of rural amenities, &c. Such schemes, which only need the confirmation of the Minister of Health, may contain provisions suspending the operation of any statutory enactment or " any Orders, by-laws, or regulations under whatever authority made " or as may be necessary for regulating the development of land and dealing with any of the following matters, among others:

(1) Streets and roads, and stopping-up or diversion of existing highways;
(2) Lighting;
(3) Extinction of easements;
(4) Buildings—*e.g.*, limiting the number of buildings or regulating their size, height, design and elevation, and the materials to be used in their construction.

Schemes may also provide for the removal or pulling-down of any existing building.

It was agreed that steps should be taken for protecting the interests of public utility undertakings.

#### LONDON PASSENGER TRANSPORT BILL.

It was reported that the Council were advised that gas companies might be damaged by the operation of Clause 17, and particularly by reason of the fact that there is no provision whereby such companies can recover compensation for any damage done to their apparatus by reason of the removal of the rails and equipment of tramway undertakings which under the Bill would be transferred to the Transport Board, who would have the power to abandon any such tramways.

It was agreed that the Council should lodge a petition in opposition on behalf of their members in the vicinity of London likely to be affected, for the purpose of obtaining the insertion of a protective clause.

The necessary resolution authorizing the lodging of the petition by the Council was duly passed.

#### COAL.

It was reported that, owing to the number of complaints which had been received from members with regard to the operation of the District Schemes under the Coal Mines Act, and in particular that of the Midland District Scheme, particulars had been obtained which showed that a large number of undertakings were suffering from the operation of the Coal Mines Acts in respect of deliveries being short of contract quantities, undertakings being forced to buy coal from other districts at enhanced prices, and the loss of earnings on wagons owned by the undertakings.

The steps which the Council had taken to bring the position before the Government were reported and approved.

#### SAFETY RULES FOR CHEMICAL WORKS.

It was reported that the Association of British Chemical Manufacturers had brought to the notice of the Council certain Model Safety Rules and Safety Circulars which they had issued, and it was agreed that the attention of members of the Council should be drawn to these circulars, and that members should also be asked to notify particulars of any accidents occurring in connection with their chemical plant.

#### RATING AND VALUATION ACT.

Reference was made to the conference which had taken place in February, 1930, between representatives of the Central Valuation Committee and representatives of gas and electricity interests, and that a communication had now been received enclosing a draft memorandum embodying a suggested scheme for the valuation of public utility undertakings which extend into more than one rating area.

It was agreed that the Gas and Electricity Associations should again co-operate in this matter, and that the memorandum should be submitted to the Committee which conferred with the Central Valuation Committee in February, 1930.

#### JOINT GAS CONFERENCE, 1932.

The Board unanimously approved the proposal to organize a Joint Gas Conference in connection with the Gas Industries Section of the British Industries Fair, Birmingham, in 1932. Messrs. H. C. Smith, P. N. Langford, and W. W. Townsend were re-elected to represent the Council on the Joint Gas Conference Committee.

# An Ingenious Display

This photograph is of the exhibit of the South Metropolitan Gas Company at the British Industries Fair (London Section). Referring to this, the current issue of the Company's Co-Partnership Journal states: "When you reach the lump of coal, turn left!" This was one directional instruction overheard at the British Industries Fair at Olympia in February last. The stand, being original in design, was used as a landmark—even during the constructional period—in the twelve miles of stands in which were exhibited the products of every branch of British industry. As can be seen by the illustration, the imitation coal gave the Company a good opportunity of showing gas lighting and heating in a novel setting; but more important on this occasion was the display of the many products resulting from the distillation of crude tar, and from the purification of gas. The "Metro" chemicals found suitably advanced positions in the rugged windows of the "coal," a log gas fire radiated warmth and comfort within it, where a number of orange-shaded "Metro" burners also played a big part in making the "fuel" glow. Few of the many visitors to the stand could have come away without realizing the efficient use that the Company makes of every ton of coal that enters the works. The day cannot be far distant when enlightened public opinion will make the wasteful consumption of coal in open grates impossible; and displays such as this must help to bring that day very appreciably closer.

# IN CONTINENTAL COUNTRIES - - -

*Abstract Translations from the Technical Press of France and Germany*

### A GERMAN INSTITUTE OF GAS ENGINEERING.

On Jan. 1, 1931, the private laboratory of Dr. Hans Löffler, Civ.Ing., Vienna, XVIII., Anastasius Grüngasse 48, was accorded official authorization, by the State Ministry of Commerce and Transport, to become the Institute of Fuel Research and Gas Engineering. The scope of the activities comprises: Examination of combustion processes of heating plants, air and gas analyses, testing of fuel in solid, liquid, and gaseous states, and of gas-generating processes, determination of heating value, examination of engines, cooking vessels, &c. The certificates granted by the Institute as a result of its examinations have the validity of official documents.

Dr. Löffler formerly worked as an Assistant to Hofrat Strache at the Technische Hochschule in Vienna, and after the death of Hofrat Strache, took over his Technical Examination Bureau.

### STATISTICS RELATIVE TO TAR IN FRANCE.

Particulars of the growth of the tar industry in France are given in Chimie et Industrie, 1931, 25, 758 (March).

The production of tar is rising due to increase in the demand for gas and to increased activity of coke oven plants. The quantity produced in 1929 was 241,000 metric tons from gas-works and 320,000 tons from coke ovens, a total of 561,000 tons, compared with 546,000 tons in 1928. Further batteries were started up in 1930—namely, at Escarpelle and at Longwy—and several old batteries have been replaced by new ones.

The above figures for 1929 do not include the tar produced in the Sarre district—5000 tons in gas-works and 122,000 tons in coke ovens. In addition, 125,000 tons of tar were imported, 32,500 tons having been exported. The total available tar was thus 779,500 tons, of which 376,000 tons were distilled to pitch, and 388,000 tons were used for road construction in France, the Sarre, and Northern Africa.

The following table shows the increase in the tonnage of tar used on the roads in France in recent years:

| Year . . | 1922. | 1923. | 1924. | 1925. | 1926. | 1927. | 1928. | 1929. |
|---|---|---|---|---|---|---|---|---|
| Metric tons . | 30,000 | 45,000 | 97,000 | 135,000 | 137,000 | 182,000 | 239,000 | 367,500 |

The increase shown by 1929 compared with 1928 is especially marked.

# HONG KONG—
## A DAZZLING SPECTACLE

*Describing his Second World Tour in "West's Gas," Mr. F. J. West gives details of the Colony*

AN AIR VIEW OF HONG KONG.

Hong Kong is the most picturesque and interesting town we have so far seen in the East. It is a British Crown Colony, and comprises the island of Hong Kong, the Kowloon Peninsula, and the Territories, the whole area covering over 300 square miles.

It is an important British station of great strategic value, commercial as well as naval; and it may be termed the gateway between the East and the West, as it is one of the greatest transhipment ports in the world. Kowloon is on the mainland, and separated from the island by a narrow channel from a mile to a mile-and-a-quarter in width. The island of Hong Kong is about 4 miles long and 32 square miles in area. The city is handsomely and well built.

It is remarkably steep in places, sloping up from the water's edge at an angle of 25 degrees towards several peaks, the highest of which is known as The Peak, and is 1500 ft. above sea-level. On the slopes, in several tiers, are many handsome residences approached by a cable tramway and well-laid-out mountain roads. From the summit we obtained a glorious view of the harbour, waterway, and surrounding islands, and at night when the city was lit up with myriads of lights we enjoyed a wonderful and dazzling spectacle. When viewed from the water, the sight is equally brilliant. A drive round the island, about 25 miles over mountainous roads, provided us with glimpses of pretty bays and inlets, splendid bathing beaches and wonderful views of the surrounding islands. The roads in Hong Kong, built by the Public Works Department of the British Government, may be said to be the finest in the world, and are a triumph of civil engineering.

# *Three Houses to be Cooled by Gas* - -*

**The Committee on Industrial Gas Research, American Gas Association, announces a plan for advanced research in this new use for gas**

By EUGENE D. MILENER, Industrial Research Representative, American Gas Association.

Following over two years' preliminary research and development work in the application of gas to house cooling and summer air conditioning, the work has advanced to the point where three practical installations will be made and operated under practical test conditions through the coming season. This announcement, which was made by Mr. F. J. Routledge, Chairman of the Committee on Industrial Gas Research of the American Gas Association, indicates that the most important milestones in recent years in the development of gas utilization have been reached.

The three houses will be located in different sections of th country so as to get a good cross-section of the air conditions. One will be on the Atlantic Seaboard, one will be in the Middle West, and one will be in the extreme South. In this way three separate and distinct climatic conditions will be encountered and the maximum of knowledge will be gained from operation during the first season. The Eastern house is located in Westchester County, N.Y., and is typical of the well-developed home life in that prosperous community.

The Middle Western house is situated in North Chicago. It is a new brick dwelling and is located in a place directly exposed to the intense heat of the sun. Both houses are now heated with gas and with the addition of gas-operated cooling and dehumidifying, they will become the first houses to be completely air-conditioned with gas the year round.

The system which has been developed for using gas for this purpose is known as the silica gel gas air conditioning process. For over two years the Research Committee has actively co-operated in applying silica gel to summer air conditioning. Very encouraging results have been secured, and last summer a large bank building was successfully air conditioned with gas. The principles developed during these last two years will be used, with modifications and improvements, in conditioning the three houses as part of the American Gas Association research.

The atmosphere in which we breathe and live contains varying amounts of moisture, the quantity of which is expressed in terms of relative humidity at any given temperatures. The ideal conditioned air for comfort purposes, therefore, should have a sufficiently low relative humidity to evaporate the moisture from our bodies as quickly as it is produced, without too great a difference in temperature

* From the "A.G.A. Monthly."

between the body and such air; otherwise, the heat capacity of the air is so much greater than our own heat output that we become chilled.

Silica gel dehumidified air is cooled to a temperature sufficiently low to remove heat developed within a building without producing the sensation of chilling. Thus, this air flow is in proper condition and of sufficient volume to take up the moisture and heat given off by the people, lights, equipment, and operations in the space to be conditioned, and still maintain a proper temperature for comfort. This flow of air is regulated to provide the best ventilation possible without draughts—important, since we have all experienced the uncomfortable down-draughts of cold air from the ordinary power-operated cooling system.

Many of us expose ourselves during the summer months in refrigerated theatres and stores to temperatures considerably below the outside temperatures, and then wonder what causes the colds, headaches, and general sluggishness upon returning to the street.

The Research Committee believes that there is no more important new use for gas than that of building cooling and summer air conditioning. While the exact load characteristics of this class of business are not definitely known at this time, it is known that every cubic foot of gas sold by this means will definitely counteract the growing winter peak load caused by residential, commercial, and industrial building heating.

These installations are the consummation of over two years' preliminary work which the Research Committee has carried on investigating all the fundamentals of house cooling, using both power and heat as the source of energy. This installation has included a study of the load gas companies can reasonably expect from house cooling; a complete survey of past work that has been done by various agencies and the status of present work by these agencies; a survey of customer acceptance of building cooling as practised at present in commercial buildings; a survey of the limitations of power systems; and an analysis of the possibilities of using gas heat as the source of energy either with absorption or other refrigerating systems, or by the direct use of solid absorbent materials which depend upon the use of heat for their operation.

The Research Committee has deemed it to be its function to find out, on behalf of the Gas Industry, if there was any way in which gas heat energy could be made to enter the house cooling and air conditioning picture. Two years ago, the Committee definitely determined that this was possible. Further than that, it determined that there were no such limitations to the use of gas heat energy for house cooling as there are when power energy is used for this purpose. Power energy is adaptable to cooling and dehumidifying buildings only by means of refrigeration, but unlike power energy, gas heat energy is also adaptable to heating adsorption materials directly, and thereby utilizing a cooling and dehumidifying cycle which has not been used up to the present time.

Air conditioning consists of preparing the air of a factory, store, theatre, dwelling, or other building so that the occupants will be comfortable. In addition, in parts of factories, air is conditioned for certain industrial processes depending upon its effect on the product being manufactured. As outside weather conditions affect the state of the air in buildings, it is chiefly to counteract outside weather that air conditioning is done. Complete air conditioning consists of cleaning and circulating; heating or cooling as necessary, and humidfying or dehumidifying as needed. Air is conditioned in the winter time by cleaning, circulating, heating, and humidifying or moistening. Air is conditioned in the summer by cleaning, circulating, cooling, and dehumidifying or drying.

Heating and humidifying as well as cooling and dehumidifying require energy. Energy for heating and humidifying is being furnished by gas heat in all sections of the country at an increasing rate. Furnaces using gas are now manufactured which clean, circulate, heat, and humidify the air, and thus render a complete winter air conditioning service—that is, they completely condition the air when the temperature and humidity is below the zone of human comfort. The list of appliances approved by the American Gas Association Laboratory shows that nine manufacturing company members of the American Gas Association now offer gas furnaces approved by the American Gas Association Testing Laboratory which completely condition the air in winter time, or offer standard accessories to be added to their furnaces to give complete summer air conditioning.

Research has brought summer air conditioning with gas to the practical stage. It is expected that, before the summer of 1932, arrangements will have been made for manufacturing and placing on the market equipment for interpreting these processes.

# NOTES ON PLANT AND PROCESSES

## The "Panella" Inset Gas Fire.

A most interesting and attractive booklet has been published by the Davis Gas Stove Company on the subject of their new "Panella" inset gas fire.

The "Panella" fire is a direct result of the suggestions made by the late Sir Lawrence Weaver in his address before the "B.C.G.A." York Conference in October, 1928. It is particularly designed to appeal to architects, and was, in fact, produced in collaboration with Sir Lawrence.

Being perfectly plain in design and having no projecting trivet or fender, the "Panella" fire will harmonize with any decorative scheme, and lend itself to any treatment of the fireplace, as several very beautiful illustrations in colour in the present booklet, depicting the fires in a number of most attractive surrounds, indicate. From these illustrations, also, it will be seen that, provided there is a satisfactory flue arrangement, the "Panella" fire need not be fixed at the floor level. It can, in fact, be raised a foot or more from the ground and requires no hearth to rest on. The illustrations in the booklet serve merely to hint at the innumerable methods of treatment to which it can be adapted.

As an efficient heating unit the "Panella" is claimed to rank high. The burner is of modern design, being of the same type as that fitted to Radiation fires of the latest pattern. In some models the burner is of the duplex type, so that, adjusted only by one tap, the whole of the fire or the centre radiants only can be used, according to the degree of warmth desired. "Beam" radiants are, of course, standard. Altogether the "Panella" fire is constructed on sound and simple lines. There is a four-sided frame with a cast-iron back attached. To this is fitted a hood to deliver the products of combustion into the chimney and to prevent the falling of chimnev dirt on to the radiants. Excepting for a hole through which the gas feed passes, the back isolates the fire from the chimney, and carries all the active parts of the fire save the radiant bar.

The booklet concludes with instructions for fixing the "Panella," together with specifications as regards the various sizes of fires obtainable and the finishes in which they can be supplied, which include ebonite, armour bright, brass or copper, pewter, and stainless steel.

## Piggott Products.

Never has there been greater need for the study of economic terms with which to meet the problems that beset our industrial activities, and the pages of a new publication by Messrs. Thomas Piggott & Co., Ltd., of Birmingham, indicate the progress in this firm's design and methods of manufacture in the common effort to keep level with advancing technique and development.

Illustrated by a number of excellent photographs of industrial steelwork, the brochure sets forth in an interesting manner details of a number of the firm's specialities. These include steel pipes for gas and water mains, and a photograph shows the layout of gas mains which were laid as far back as 1900 to convey gas across the Tyne via the railway bridge at Scotswood. There are two 2-ft. gas mains of Piggott's pipes crossing this bridge.

A section is devoted to gasholder construction, various types of which the firm erect, including vertically-guided, spiral-guided, and Klönne waterless pattern. Illustrations show stages in the construction of a three-lift holder with steel tank, designed for a capacity of 1,500,000 c.ft. by Mr. George Evetts, M.Inst.C.E., for the Bombay Gas Company. The advantages of the waterless type of gasholder are set out. Pressed steel tanks of various designs receive attention, including tanks for bulk storage, wagon tanks for transport, and cylindrical, circular, sectional, or square tanks for water, oil, tar, &c. Tanks of mild steel, stainless steel, monel metal, or aluminium are all produced by the firm.

Finally, mention is made of the welded work and furnace work carried out by the firm, together with details of the "Jewell" water purification and sterilization plants, for which Messrs. Thomas Piggott are the sole British licensees and manufacturers.

# THE "JOURNAL" TECHNICAL RECORD

*Which also contains Full Reports of Meetings of Gas and Allied Associations* ———

## Australian Gas Institute

**Presidential Address of Mr. H. TINDALE, Engineer for Works of the Australian Gas Light Company, Sydney, at the Fourth Annual Convention, held in Sydney, Australia**

During the comparatively short space of thirty years, the function of the Gas Industry in Australia, in common with that of the Industry throughout the world, has completely changed from that of a purveyor of light to that of a purveyor of heat. The Gas Industry in Australia can no longer be regarded as a lighting Industry. The lighting load was practically lost some six or eight years ago, and, with few exceptions, electric light has now been substituted for gas. Perhaps in a climate such as that of Australia, gas lighting, because of the heat generated, is unsuitable, and its replacement by an illuminant which generates little heat would have eventuated sooner or later. Whatever the reasons may have been they are not material now; the fact remains that the electrical industry has ousted gas from the lighting field.

Thirty years ago, the Gas Industry's main competitors were kerosene and candles. Later, as the Industry entered the field of cooking, it came into competition not only with solid fuels, coal, and wood, but also with one of its own bye-products, coke. Now, however, we have electricity, fresh from its triumph of securing the lighting load in Australia, challenging gas for the cooking load. As if these were not enough, we also have liquid fuel and brown coal briquettes as the latest entrants into the field of heat, challenging gas more particularly in the industrial arena. Whereas thirty years ago, gas had only two competitors, nowadays we have a formidable array of very active ones.

Except in country districts, firewood is not regarded as a serious competitor of gas. Except in Tasmania, hydro-electricity is not producible in quantities which are significant, and the fuel oil which we use must be imported. Unfortunately, owing to the high price of coal, oil fuel is proving to be a formidable competitor for industrial purposes.

The population of Australia is concentrated in a strip of land not much more than 350 miles wide along the north-eastern, eastern, and south-eastern parts of Australia and also in the south-west corner. Nearly all the fuel required is used in that part of Australia, and in consequence the whole of the electric and gas undertakings are concentrated in the same areas.

Eighty-seven p.ct. of the gas made in Australia during the year ended June, 1929, was supplied by the Metropolitan undertakings, one undertaking alone supplying about 40 p.ct. of the total gas required.

With regard to bye-products, in the year under review, all States have shown an increase in the quantity of tar produced per head of population, but only two States show an increase in the sales of tar. Until about 1927, all the tar sold was used for road-making purposes, and the surplus, if any, was used on the works as a fuel. Of recent years, however, large quantities of tar have been sold for fuel purposes as indicated. A noticeable feature is the tremendous increase in the quantity of bitumen used per head of popuation. Nearly all the bitumen imported into Australia is used for road-making purposes, and thus becomes an important competitor of tar, but the demand for bituminous material in Australia has now grown to such large dimensions that the production of tar, were it wholly used for road construction purposes, would not be sufficient to meet road-making requirements.

The production of sulphate of ammonia is of interest, and emphasizes the remarkably good work done by the late Sulphate of Ammonia Propaganda Association. As the result of its activities the percentage of the production sold in Australia has increased from 47 p.ct. to 100 p.ct.

A detailed examination of the coke consumption shows that the reduction in such consumption is mainly confined to the capital cities, from 3·27 cwt. per head of population in the areas served by gas undertakings in 1921 to 2·9 cwt. in 1929. The coke sold per head of population in the country has been fairly stationary at 1·39 cwt. in 1921 and 1·33 cwt. in 1929.

### Heat Required for Domestic Purposes.

The Gas Industry regards itself as the logical supplier of heat for the purposes of cooking food, heating water, and the provision of bodily warmth. Gas has entered largely into the domestic field, inasmuch as the consumers of gas represent from 15 p.ct. to 20 p.ct. of the population in the areas served by gas undertakings. On the assumption that each consumer has an average household of 4·5 persons, it would appear that gas is relied upon by 75 p.ct. to 90 p.ct. of the population for heating purposes. The Gas Industry can therefore fairly claim to be a material factor in our social life and in the standard of living.

The quantity of gas required for room heating was ascertained by multiplying the number of degree-days for each capital city by a factor consisting of the number of B.Th.U. required per degree-day, obtained from practical experiments carried out in my home with both gas and electricity. The use of the degree-day as a measure of heat requirements originated in the United States of America and was fully explained at the 1928 World Power Fuel Conference. The degree-day is the product of the number of days in each month of the heating season multiplied by the difference between the average temperature for each month and 65° Fahr. For example, if the average temperature for a month of 31 days is (say) 50° Fahr. the difference between that temperature and 65° Fahr., viz., 15°, multiplied by the number of days in the month, viz., 31, gives a product of 465, which represents the degree-days for the month.

The following are the yearly degree-days for the capital cities:

| | Degree Days. |
|---|---|
| Brisbane | 615 |
| Sydney | 1429 |
| Melbourne | 2554 |
| Adelaide | 1648 |
| Perth | 1296 |
| Hobart | 3889 |

From tests which I have made, it would appear that 1000 B.Th.U. are required in the form of gas for each gas fire and 700 B.Th.U. for each electric radiator per degree-day. The relation between the above factors for the heat in the form of gas and electricity agrees closely with those published in the transactions of the 1928 World Power Fuel Conference.

With regard to the cost of supplying the amount of heat thus ascertained, the rates for gas and electricity used were the actual prices of the gas supplied without discount, and the minimum prices at which electric current is obtainable for domestic purposes in the respective capital cities. Table 1 discloses that the cost of providing the same measure of heat-comfort is generally very much greater in the form of electricity than it is in the form of gas. For purposes of comparison, the actual average consumption in therms per consumer for gas and electricity used for all purposes in each capital city is also shown. It must be borne in mind that in the case of electricity many large consumers are entirely industrial in character, and a large quantity of electricity is used for power and lighting only. Nevertheless, in order to ascertain the relative importance and popularity of gas and electricity in catering for domestic requirements, it would be permissible to assume that the whole of the electricity supplied was used for domestic purposes. Even on that basis, it is evident that the average consumption of heat in the form of gas is much closer to the index of the standard of heat-comfort than is the heat in the form of electricity. Hence, it is reasonable to deduce that electricity has not yet supplanted gas for domestic purposes, and, in fact, apart from lighting, the total quantity of heat in the form of electricity used for domestic purposes is still negligible.

TABLE 1.—*Quantity of Heat in Therms Required per Family consisting of Man, Wife, and Two Children, on Basis of 51 Weeks per Annum.*

GAS.

| Town | Brisbane. | Sydney. | Melbourne. | Adelaide. | Perth. | Hobart. | Remarks. |
|---|---|---|---|---|---|---|---|
| Degree Days | 516 | 1429 | 2554 | 1648 | 1296 | 3889 | |
| Cooking | 80·12 | 80·12 | 80·95 | 80·12 | 80·12 | 81·72 | 15 p.ct. has been added to the gas consumed in the cooking tests to cover wastage and variations in modus operandi of various persons using gas. |
| Laundry | 25·0 | 25·25 | 26·0 | 25·25 | 25·25 | 26·75 | |
| Baths | 19·92 | 39·85 | 45·83 | 39·85 | 37·86 | 47·82 | |
| Fires | 5·2 | 14·3 | 25·5 | 16·5 | 13·0 | 38·9 | |
| Total | 130·24 | 159·52 | 178·28 | 161·72 | 156·23 | 195·19 | |
| Equivalent to volume in c.ft. of gas of respective calorific value | 25,640 | 29,000 | 32,710 | 29,400 | 32,900 | 35,740 | |
| Cost of gas in pence per therm | 17·1 | 12·5 | 15·6 | 20·3 | 20·0 | 22·1 | |
| Total cost | £9 5s. 7d. | £8 6s. 2d. | £11 11s. 9d. | £13 13s. 7d. | £13 0s. 5d. | £17 19s. 6d. | |
| Actual average therms used per consumer for all purposes | 127·5 | 148·5 | 126·5 | 106·9 | 91·91 | 75·82 | |

ELECTRICITY.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cooking | 42·61 | 42·61 | 43·1 | 42·61 | 42·61 | 43·5 | |
| Laundry | 13·2 | 13·3 | 13·7 | 13·3 | 13·3 | 14·1 | |
| Baths | 14·7 | 29·4 | 33·8 | 29·4 | 27·93 | 35·28 | |
| Fires | 3·6 | 10·0 | 17·9 | 11·5 | 9·1 | 27·2 | |
| Total | 74·11 | 95·31 | 108·5 | 96·81 | 92·94 | 120·08 | |
| Equivalent to electric units | 2170 | 2790 | 3178 | 2834 | 2721 | 3514 | |
| Minimum cost of current in pence per unit to domestic consumer | 1·70 | 1·25 | 1·25 | 2·25 | 1·25 | 1·75 | |
| Total cost | £15 7s. 5d. | £14 10s. 7d. | £16 11s. | £26 11s. 4d. | £14 3s. 5d. | £25 12s. 6d. | |
| Actual average units used per consumer for all purposes | 436 | 1847 | 939 | 793 | 1218 | 1306 | |

## IMPORTANCE OF WATER HEATING LOAD.

On an average, of the total heat used—

| | P.Ct. |
|---|---|
| Cooking requires | 50 |
| Water-heating for baths and laundry | 40 |
| Room-heating | 10 |

In the northern and warmer parts of Australia, the gas required for cooking will probably bulk to the extent of 70 p.ct. or more of the gas used, while in the southern and colder parts, the percentage of gas so used may be as low as 30 p.ct. of the total. Under English conditions, the proportion of heat required for the above purposes is approximately as follows:

| | P.Ct. |
|---|---|
| Cooking | 13 |
| Water-heating | 43·25 |
| Room-heating | 43·75 |

On the average, every gas consumer who is now using a stove only would have his consumption doubled if he could be persuaded to use gas for the heating of water and rooms. The importance of this load has already been realized by our electrical competitors, and they are making a bold bid to secure it. That there exists a big potential field is shown by a canvass made of areas served by two of the gas undertakings in two capital cities. This canvass showed in one case that, of the gas consumers, only about 46 p.ct. had coppers, 38 p.ct. had bath heaters, and 2 p.ct. had fires. In the other case, it showed that only 22 p.ct. had coppers, 20 p.ct. had bath heaters, and 1 p.ct. had fires. I estimate that if those consumers who are not now using bath heaters, coppers, or fires could be persuaded to adopt such appliances, the average quantity of gas consumed per private consumer would be increased from 142 therms—as in the case of the Australian Gas Light Company's consumers—to approximately 193 therms per annum, equal to about 35,000 c.ft. per consumer, which quantity would make every consumer a profitable one.

It will probably be asked, Can the man on the basic wage afford to pay for the quantity of heat shown in the standard of heat-comfort suggested? The average basic wage throughout Australia was, until very recently, about £4 5s. The cost of supplying heat in the form of gas and electricity in the various capital cities would represent the following percentages of that basic wage:

TABLE 2.—*Showing Cost of Using Gas and Electricity for Domestic Purposes on Basis of Standard of Heat Comfort, Expressed as a Percentage of the Basic Wage of £4 5s. in 1929.*

| Capital City. | Gas. | Electricity. |
|---|---|---|
| | P.Ct. | P.Ct. |
| Brisbane | 4·28 | 7·09 |
| Sydney | 3·83 | 6·70 |
| Melbourne | 5·34 | 7·64 |
| Adelaide | 6·31 | 12·25 |
| Perth | 6·00 | 6·55 |
| Hobart | 8·29 | 11·82 |

From this it will be seen that the basic wage earner would find the use of gas much more economical than electricity in all capital cities. In the country, on the other hand, solid fuels, particularly wood, become the most important competitors of gas. It is interesting to note that the quantity of wood fuel allowed for in the basic wage is 3·8 tons for a year of 51 weeks, and by applying the data given by Dr. Margaret Fishenden and Mr. Barker to that obtained by the foregoing tests, the quantity of coal or coke required would be 2·1 tons and wood 4·2 tons, the latter being 0·4 tons in excess of that allowed for in the basic wage, due doubtless to the extra allowance for heat in the heating of water in the standard of heat-comfort. It is interesting to note also that the cost of the electricity required for Melbourne, given in Table 1, agrees very closely with certain information published by the Victorian Electricity Commissioners in connection with the cost of electricity for all electric houses in Victoria.

Table 3 shows the costs of cooking with various fuels when gas costs 12d. per therm:

TABLE 3.—*Showing the Maximum Prices that Wood, Coal, Coke, Delivered into Consumer's Bin and Electricity could be when Gas Costs 12 Pence per Therm (Domestic Uses Only).*

WOOD.

| | Per Ton. s. d. |
|---|---|
| For cooking | 28 0 |
| For water heating | 70 0 |
| For fires | 46 9 |

COAL AND COKE.

| | Per Ton. s. d. |
|---|---|
| For cooking | 56 0 |
| For water heating | 140 0 |
| For fires | 43 4 |

ELECTRICITY.

| | Pence per Unit. |
|---|---|
| For cooking | 0·770 |
| For water heating | 0·660 |
| For fires | 0·592 |
| For refrigerators | 0·593 |

There is another potential cooking load available to the Industry—viz., that of the baking of bread. The quantity of bread consumed per head of population is 200 lbs. per annum, and it would require about 1·25 therms to bake that quantity. There is every reason for believing that the baking of bread will, in future, be done by mass production in large bakeries with up-to-date appliances and machinery. Hence it behoves the Gas Industry to secure such a load. Unfortunately, the competition with oil fuel is particularly keen, but, despite that competition, important installations of gas-fired bakeries are to be seen in Sydney.

We are now in a position to determine the potential demand for gas per head of population for the various purposes for which gas is required in the preparation of foods

and for water and room heating. The details are as follows:

| | Therms. |
|---|---|
| Cooking | 20 |
| Water-heating | 12 to 18 |
| Fires | 2 ,, 9 |
| Baking | 1·25 |

Total from 35 to 48 therms per head of population, being equal to about 6300 to 8700 c.ft. of gas of 550 B.Th.U., or from 25,000 to 35,000 c.ft. per consumer. Since the demand for therms per head of population in Australia ranges from 5·8 to 31, it is evident that there is a large field for gas still untouched.

### Heat Required for Industrial Purposes.

Industrial gas so far has not bulked very largely in the quantity of gas supplied by Australian undertakings. Of the total value of production in Australia, the value of fuel and light is barely 3 p.ct.

On the assumption that 90 p.ct. of the factories are situated in the capital cities, the value of fuel and light represents about £3 per head of population per annum. About 475 therms are required annually per head of population for all purposes. Of that quantity only a portion of the heat obtained from oil, coal, coke, and briquettes could reasonably be replaced by gas. No detailed survey of the fuel requirements of industries in Australia has so far been made, and one can only hazard an estimate, but on the assumption that 10 p.ct. of the coal used for domestic purposes and 25 p.ct. of the oil could be replaced by gas, provided costs were satisfactory, there would appear to be a potential load of 5 to 10 therms per head of population.

A new industrial field for the Gas Industry is the supply of compressed gas. Inquiries which have been made indicate that quite an appreciable amount of compressed gas would be used by plumbers and builders on new constructions, if the cost were reasonable. Oxy-coal gas for cutting purposes is in demand both for city and country work. There is also the possibility of using compressed coal gas as a substitute for motor spirit for motor 'buses and heavy transport duty, as is done extensively in France and, in an experimental way, in Sydney, by the Australian Gas Light Company. Should a demand for compressed gas eventuate, there would then be justification for the supply of "bottled gas" for domestic purposes in those districts beyond our line of mains, where the capital required for a reticulation system makes the cost of supplying gas prohibitive. With "bottled gas" such districts could be secured for gas, pending the time when they had sufficiently developed to justify connecting up to the main distribution system. The grand total of the potential gas load per head of population appears to be between 40 and 58 therms, but it will be noticed, and I desire to emphasize, that the potential domestic consumption accounts for 70 to 80 p.ct. of the total load available.

The general increase in the price of gas since 1912 is very marked, but despite large increases in prices, it is evident that the popularity of gas has not, as a consequence, been materially affected.

### Present and Future Prospects of Electrical Undertakings.

The information which has been obtained relating to the progress of the electrical undertakings shows that very great progress has been made, the quantity of current used for all purposes having quadrupled since 1920. A large percentage of the increase is due to the increased use of electricity for power purposes, the horse-power of motors having trebled in the same period. There are, however, good reasons for believing that so far electricity has not yet adversely affected the use of gas for domestic purposes, though for power purposes, the horse-power of the gas engines in use has decreased by 12 p.ct. since 1921.

Nearly all the large electrical undertakings are either owned by State Government or by Municipal Councils, and considerable capital has been expended in those undertakings. Table 4 shows some interesting comparisons of the capital expenditure involved in the larger electric and gas undertakings in each State, as at the end of 1929. Attention is drawn to the large differences in the respective capital expenditure per therm generated by gas and electric undertakings and in the percentages of the revenue required to meet interest on borrowed moneys, capital, and depreciation.

Table 4.—*Comparison of Capital Employed in Largest Electric and Gas Undertakings in either State or Capital Cities of Australia—Year 1929.*

| — | Electricity. | Gas. |
|---|---|---|
| Total capital employed | £37,979,757 | £15,293,872 |
| Approximate population served | 3,100,000 | 2,715,000 |
| Therms made per head of population | 14·64 | 31·88 |
| Capital employed per therm made | Max., £2 2s. (Adelaide)<br>Min., 6s. 2d. (Tasmania) | Max., 6s.<br>Min., 3s. 1d. |
| Capital charges, p.ct. of revenue | Max., 75·9 p.ct. ,,<br>Min., 46·3 p.ct. (Sydney) | Max., 35·2 p.ct.<br>Min., 22·1 ,, |

It will be interesting to see how the electrical undertakings will fare as the result of the reduced demand for energy, which is being experienced to-day, owing to the current financial depression. Since they have been hitherto operating at maximum efficiency, will they find it necessary to increase their rates for energy to meet their proportionately increased capital charges, or will they rely on Government and municipal taxes to make up deficiencies? There is, however, one definite outcome of the position with which electric undertakings are faced, and that is an intensified selling activity to secure as big a load as possible to make up for deficiencies.

There is one aspect of the generation of electric current that will have to be borne in mind by the Gas Industry much more in future than it has been in the past. Fifteen to twenty years ago, for every consumer requiring an adequate quantity of heat it would have necessitated the processing of about 5·5 tons of coal for the consumer of electricity and 2·3 tons of coal for the consumer of gas. On an average to-day, it would require 3 and 2 tons of coal respectively; but if we make a comparison on the basis of the most efficient power-house as at Bunnerong, Sydney, and the most efficient gas-works in Australia, then it would require the processing of 2 tons of coal for the electric consumer and 1·75 tons of coal for the gas consumer.

The respective prices at which coals are supplied to gas and electric undertakings should, in future, have a much closer relation to one another; in fact, there is now much less justification for the difference which hitherto has existed between the respective prices of gas-making and steaming coals. It is, therefore, evident that gas undertakings must secure as large a net return as possible from bye-products as an off-set for differences in the initial prices of coal.

With regard to the future expansion of the electrical industry and the lines upon which that expansion will take place, the following remarks made by Mr. W. H. Myers, B.E., in a paper read before the Engineering Conference, Newcastle, March, 1929, and since confirmed by the Royal Coal Commission, will prove of interest to the Gas Industry:

"Viewing the development of Australian power stations, as a whole, it is apparent that these stations are mainly confined to the cities along the coast, but from time to time cases have arisen, and will continue to arise, where such stations have to be considered for the extra coastal areas (say) within a few hundred miles of the coast. The major factor commercially and technically, limiting the design of such power stations even where the loading (present or anticipated) appears to justify action, is the difficulty of making provision for sufficient cooling water for the steam plant.

"It is the author's opinion that the local solution of the problem of electric power supply to the extra coastal or country areas, lies in the direction of suitably combining by elected interconnected lines, the few hydro-electric stations with the larger and more dependable steam power stations, but that, even on economic grounds, the popular (or political) idea as to the value of hydro-electricity in this country (excluding Tasmania) is largely a fallacy."

The Coal Commission confirmed the above, and is likewise of the opinion that "the principal factors prejudicial to the development of economical supply of power in Australia are undoubtedly the low density of population and the consequently slow development of industrial power requirements. The development of electrical reticulation calls for a large provision of capital for development work, which in many cases is not available. Except in a few favoured localities the lack of water in sufficient quantities for condensing purposes is a severe handicap to power generation from coal at inland sites."

### Coke.

The survey which was recently made by the Australian Gas Light Company of the bye-products position in Australia shows alarming reductions in the consumption of coke in the capital cities, particularly since 1926. The surplus production of coke would have been much more pronounced had the horizontal system of carbonization prevailed. Under that system, each ton of coal yields about 10 cwt. of coke for sale; but with the modern vertical retort, that quantity has been reduced to a figure anywhere between 9 cwt. and 7 cwt. per ton of coal. The economical production of gas per ton of coal carbonized in the most modern vertical retort system has now nearly

reached the limit of efficiency. Yields of over 110 therms of 500 B.Th.U. gas per ton of coal cannot be materially increased, without a considerable reduction in the calorific value of the gas, and the efficiency of the process, likewise in the thermal output per carbonizing unit.

In the present state of our knowledge, there would appear to be no alternative but to convert the surplus coke into gas by means of water gas plants. The Sydney and Newcastle Gas Companies, many years ago, were obliged to resort to that means of disposing of their surplus coke. Melbourne and Perth Gas Undertakings have now found it necessary to follow suit, and the indications are that the gas undertakings of other capital cities will, likewise, have to adopt water gas plants at an early date. Hobart apparently is the only city that has not yet reached saturation point in the sales of coke. At the existing rate of decrease in the sales of coke, the demand for that material five years hence will be about 20 p.ct. less than that now obtaining in the capital cities.

The conversion of coke into gas necessitates the use of oil for enrichment purposes, and the quantity of coke to be gasified will require the use of oil bulking annually to many millions of gallons. During the twelve months ended June, 1930, over 5 million gallons, valued at nearly £100,000, were used, and the indications are that that quantity will be doubled in less than five years. The use of such large quantities of oil means, not only an adverse effect on the balancing of our imports and exports, but also a corresponding reduction in the use of Australian coal. I may add that the quantity of gas-making oil used last year represented about 60,000 tons of coal, and the quantity of coal which was thus displaced equalled 5 p.ct. of the coal carbonized in the capital cities.

An alternative to the use of oil would be the utilization of shale, either carbonized separately or mixed with coal in vertical retorts. I would point out that in the carbonization of shale the volatile matter recoverable as gas and oil represents some 60 p.ct. of the heat content of the shale. Of the heat present in the volatile matter, approximately 40 p.ct. is in the form of permanent gases, and the balance in the oils recovered. Therefore, by the carbonization of a good shale, nearly one-fourth of the heat present in that material could be recovered in the form of a very rich gas—being a little less than the gaseous therms obtainable from the carbonization of coal—and nearly one-half in the form of oils and tars of value for fuel purposes—being three times more than that recoverable from coal—leaving a balance of only 3 cwt. of poor coke for sale, in contrast with 7 to 8 cwt. from coal. In the case of the Australian Gas Light Company, Sydney, it would be necessary to carbonize between 4 and 5 cwt. of shale for each ton of coal, and the quantity of coke obtained from the shale would bulk to the extent of 15 p.ct. of the total coke produced. The mixed cokes from the coal and shale should be satisfactorily gasified in automatic C.W.G. plants, as the ash content of the mixture would not exceed 20 p.ct.

Failing increased markets for coke as a solid fuel, its conversion into a motor fuel, such as methanol, suggests itself, but although the manufacture of methanol is now carried out on a commercial scale in England and America, there is not yet sufficient data available to determine whether such a process would be financially worth while in Australia. The hydrogenation of coal for enrichment purposes is also a process worth noting. It has, however, not yet developed commercially, but it is one which will prove of immense importance to the Gas Industry in Australia, and its development, together with that of methanol, should be closely watched.

Under existing methods of coal carbonization, the production of coke is inseparable from that of gas. Hence the disposal of surplus coke is becoming an economic problem, the satisfactory solution of which is of great importance to our Industry. One, therefore, concludes that the production of coke will be a dominating factor in determining future methods of gas production, more particularly in the capital cities.

*(To be concluded.)*

# Western Junior Gas Association

## Visit to the British Mannesmann Tube Company, Ltd., Newport

Members of the Association visited the Newport Works of the British Mannesmann Tube Company, Ltd., on April 9, where they were conducted over the works by Mr. W. H. Bevan and other members of the staff.

The Newport Works comprise two weldless steel tube mills, finishing department, machine shops, lap-welded steel pipe department of six units, power plant, and offices, and cover an area of upwards of 100 acres.

Housed in four main bays, each with a length of 244 ft. and a span of 78 ft., the two weldless steel tube mills are served by two 25-ton Vaughan electric overhead cranes, the auxiliary plant and steel stock being served by two 5-ton cranes of similar make. Round ingots of steel, varying in size, composition, and tensile strength in accordance with the class of tube required, are unloaded from railway truck by a lifting magnet, and are stacked according to their various grades. They are fed by a hydraulic ram into one of two continuous furnaces, and roll down skid pipes in the furnace through various stages of increasing

SCREWING THE ENDS OF TUBES TO TAKE SOCKETS.

heat until, when discharged from the far end of the furnace, they have attained a temperature suitable for the piercing operation.

From the furnace, the white-hot ingot is carried by an overhead crane to the piercing machine, in which it is rotated at high speed by the aid of steel rolls of special design, at the same time being forced forward over a mandrel with piercing head. This operation converts an ingot that perhaps originally was 3 ft. 6 in. long, into a hollow bloom of from 6 ft. to 8 ft. in length, this machine being capable of piercing ingots up to 17 in. in diameter. Some idea of the power needed to produce this hollow bloom is shown by the fact that the piercer is driven by a compound tandem steam engine developing 2500 H.P., built by Messrs. Cole, Marchant, & Morley, the drive being transmitted from a wheel 18 ft. 6 in. in diameter to a second motion wheel 21 ft. in diameter, through 42 ropes 2 in. in diameter.

From the piercer, the hollow bloom is conveyed on an electrically driven bogie that feeds the two rolling mills. In these mills a mandrel bar is inserted in the bloom, which is forced forward by hydraulic power between specially designed steel rolls. This action of swaging or rolling converts a hollow bloom measuring (say) 6 ft. to 8 ft. in length into a tube perhaps 50 ft. or 60 ft. in length, of the required diameter and thickness. In these mills, tubes are rolled to a maximum diameter externally of 13¼ in., and in length up to 80 ft. or even 100 ft. in one piece. Both mills are driven simultaneously or individually by an engine similar to that driving the piercer.

The piercing and swaging operations are carried out at a single heat, the finished tube as it leaves the mill, while having grown in length from (say) 3 ft. 6 in. to 80 ft., still being visibly red. It is obvious that no steel but that of the very highest grade obtainable could withstand the punishment it receives in the piercing machine and in the rolling mill.

When the tube emerges from the mill, the next operation is to straighten it, and special machines with bevelled steel rollers carry out this operation rapidly and accurately. From the straightening machine, the tube, which by this time has cooled to atmospheric temperature, is taken to one of a battery of double-headed cutting-off machines, where the pilger head and the open or ragged end of the tube are cut off.

After inspection and gauging, the lengths of plain tube pass on to one or other of the sections of the finishing department, according to the purpose for which they have been rolled. The ends may be screwed for loose sockets, they may be flanged for rigid or flexible joints, or they may be staved for spigot and faucet ends. Spigot and faucet tubes are used mainly for gas and water mains. Their ends are heated in a coal-fired furnace and are then expanded and belled out to form the joint, this operation being done in an horizontal and vertical hydraulic press.

After the ends have been formed, the tubes are tested in one or another of the hydraulic pumps provided for the purpose, these being fitted with intensifiers to give a maximum pressure of 2 tons per sq. in. Having passed these tests, the tubes are dipped into a tank of a special preservative preparation that coats them either on the outside or inside, or on both surfaces, the coated tube then being held in a machine which rotates it while the exterior is wrapped with jute cloth saturated with a special bitumastic solution which sets hard when cold.

All these operations are carried out practically in a straight line in one of the four bays, and the finished tube can then be loaded immediately into railway trucks on the siding that crosses the end. Screwed pipes are threaded in hollow spindle screw cutting lathes with a single point tool, and finished with a chaser. Sockets are formed of weldless tube cut into lengths and tapped in screwing machines.

In the finishing department bending machines are installed, in which lengths of weldless tube can be bent accurately to given dimensions, the tubes being filled with sand and bent either cold or hot, according to circumstances. Branches, tea-pieces, and bends of short radius are welded by the "Quasi-arc" or oxy-acetylene process.

The lap-welding department consists of three bays each 660 ft. in length with a span of 78 ft., served by two 3-ton Babcock & Wilcox overhead electric cranes. Steel plates for conversion into pipes reach the works flat, and are bent in one of two sets of bending rolls which will take plates up to 26 ft. in length. These plates are bent cold into circular shape when the thickness does not exceed 1 in., plates of thicker gauge being heated in a specially designed gas-fired furnace prior to bending.

They are then conveyed to one of six welding machines, each of which is capable of taking pipes up to 6 ft. in diameter. In this machine, the joints are welded by bringing a length of 2 ft. at a time to a welding heat by gas flame impinging both on the external and the internal edges of the joint, the heated metal being then rolled and welded together under hydraulic pressure. Water gas used in the welding unit is supplied by three Dempster generators of the latest type. After welding, the pipe is heated to a blood-red in a gas-fired furnace, from which it passes to bending rolls which roll it to a true circular shape, the weld being annealed by the heating process. After this operation, the pipe passes down the shop for the ends to be formed into spigot and faucet joints, or to have flanges welded on.

The Company's activities are not merely confined to the production of weldless steel mains, but they also include a variety of steel tubes covering the following items: Transmission, telegraph and telephone poles, high-pressure gas cylinders, boiler tubes, flanged steam and hydraulic mains, lamp standards, ships' masts, &c.

After the visit the party were entertained at tea, and the President (Mr. A. Barrett), in expressing appreciation of the manner in which the visit had been conducted, said that everyone had spent a most interesting afternoon.

# Scottish Junior Gas Association (Eastern District)

## Paper on Paints and Oils

Members of this Association visited the Forth Bridge on Saturday, April 4. Mr. Graham Bell, Bridge Inspector, of the Forth Bridge Railway Company, met the party at Dalmeny Station and walked across the Bridge with them, explaining details of construction and dimensions.

Pictures of the great bridge have familiarized readers with its general appearance, but to convey to the lay mind some impressions of the gigantic erection it may be convenient here to summarize the leading dimensions. The total length, including the approach viaducts, is 8295 ft., the length of the cantilever portion being 5350 ft. The deepest foundation below high-water mark is 91 ft. There is a clear headway of 150 ft. for a breadth of 500 ft. for vessels passing under the large centre spans, and a depth of water below the North span of 218 ft. The two large spans are each 1710 ft., with a half span on each side of 690 ft. Each span (ten on the South side and five on the North) of the approach viaducts is 168 ft. The average weight of masonry in each of the main piers is 18,000 tons, while the weight of steel used in the entire structure is 51,000 tons. The surface requiring to be painted extends to some 135 acres, and painters have been busy doing this, by means of staging suspended from the structure, for the last 40 years. One third of the bridge is painted annually, and when the three years' task is completed, it is started all over again. The average strength of the painting squad is 30 men, and the annual consumption of paint is about 18 tons. It takes 54 tons of paint to cover the whole bridge.

About 8 million rivets and 42 miles of bent plates were used in the bridge. The main members—*i.e.*, the vertical columns and horizontals forming the main piers—are 12 ft. in diameter. The work was commenced in April, 1883, and the bridge was completed in December, 1889. The formal opening of the bridge was made by H.R.H. the Prince of Wales (afterwards King Edward VII.) on March 4, 1890.

Later, in the Council Chamber of the Dunfermline Corporation, the following paper was read.

### PAINTS AND OILS.

By WILLIAM A. ALEXANDER, of Messrs. Gemmell & Thin, Edinburgh.

The title of this paper is perhaps rather misleading—a more suitable one would be "Paints and Oils used as Protective Media"—for I propose to deal only with paints and oils which are used industrially as anti-corrosive agents, rather than those used for purely decorative purposes. In this connection, however, it may be remarked that it is very fortunate that the best and most used anti-corrosive paints are, with one exception, unobtrusive in colour—the thought that our Forth Bridge and other prominent landmarks might have required a powerful green

or glaring scarlet paint in order to protect them is—well, not a pleasant one.

It is generally agreed that the best method of protecting iron is by coating with an oil paint, from the points of view of both economy and practicability. This will be seen on reviewing the other valuable methods, which are, briefly:

(*a*) Enamelling—*i.e.*, covering with a vitreous coating by the aid of great heat.
(*b*) Coating with other metals which more readily withstand oxidation, such as copper, zinc, tin, nickel.
(*c*) Pickling or browning—*i.e.*, causing a hard layer of oxide or other compound to be formed on the metal which is capable of protecting the under surface (magnetic oxide of iron).
(*d*) Although hardly in the same category as the above, mention must be made of the so-called rustless or stainless steels. This material is made by alloying small quantities of chromium, vanadium, tungsten, and molybdenum with the iron. The presence of these elements, particularly chromium, renders the iron much more capable of withstanding the action of the atmosphere.

The first three methods, although much used for small articles, are obviously not practicable when preserving large structures. The last-named method is still largely in the experimental stage, although, personally, I am of opinion that it is the method of the future.

## "Driers."

We are left, then, with paints and oils as the practical protective agents. An oil paint consists of three ingredients—the oil or vehicle, as it is called, the pigment or base, and the drier. The pigment is first finely ground, after which it is intimately mixed with the oil. The drier is generally incorporated in the oil during its manufacture. The term drying as applied to paints is rather a misnomer. A paint does not really dry at all in the ordinary sense of the word—that is, the oil does not evaporate, but absorbs oxygen from the air, forming a solid compound which takes the form of a hard impervious skin gradually increasing in thickness as oxidation proceeds. Only certain oils have this property of absorbing oxygen and hardening, and these are known as "drying oils." The best known of these oils are linseed, poppy seed, menhaden, hempseed, walnut, Chinese wood oil, or tung oil; and it will be observed that they are all of vegetable or animal origin. Chemically they are known as salts or esters of fatty acids—that is, they consist of an alcoholic substance and an acid. The alcohol in the case of all vegetable or animal oils, whether of the drying class or not, is glycerine, while the fatty acid varies in different oils.

In the drying oils, it is linolic or linolenic, and to the presence of either of these acids in the oil must be attributed its property of absorbing oxygen. The function of the drier is simply to accelerate the absorption of oxygen and so shorten the period of "tackiness." It usually consists of a substance like manganese or lead oxide, capable of giving up its oxygen to the oil, the latter absorbing it more readily from the drier than from the air.

## The "Vehicle."

We may now consider the different paint ingredients separately. Dealing first with the vehicle, the only one in common use is linseed oil, as from the points of view of both economy and desirable properties it stands alone. The seeds of the flax plant (linseed) are first sifted to remove dust and dirt, as far as possible, and then crushed. The crushed seed is heated, packed into woollen bags, and the bags are hydraulically pressed. The crude oil is thus expressed, and after filtering through horse-hair cloths undergoes a process of refining. This usually consists of heating to about 170° Fahr., followed by washing with dilute sulphuric acid and finally water. The crude oil as it leaves the press is usually deep brown or even green in colour, and contains impurities which would cause it to go rancid very quickly; but after refining, these impurities are removed and the well-known yellow oil, the raw linseed oil of commerce, is obtained. Before being used for making paint, this raw oil is heated to about 500° Fahr., which process greatly accelerates its drying properties. It is during this boiling process that the driers are added, usually in quantities of the order of ¼ p.ct. When cool, this boiled oil is ready for making paint.

Linseed oil, both raw and boiled, must conform to certain definite standards of purity—*i.e.*, colour, taste, drying time (under 24 hours), refractive index, specific gravity, and general chemical properties. Adulterants are sometimes added in making inferior brands of paint. These usually consist of cheaper and sometimes non-drying oils, such as mineral oils, fish oil, &c., resulting in slow drying and cracking and blistering of the painted surface.

## Oil Analysis.

I must admit here that an oil analysis is one of the most difficult to undertake—that is, if the sample is adulterated with another oil of the same family. This is because some of these vegetable oils differ very slightly in their chemical and physical properties, and if present in quantities under 10 p.ct. their detection becomes very doubtful. For example, 10 p.ct. of soya bean oil in linseed is difficult to detect, and might quite well be put down to a bad sample of pure linseed oil by an analyst, but—and at this point chemists must bow the head—not by the man who works continually with linseed oil. He relies on his sense of smell and taste for detecting adulteration, and generally with success.

The choice of pigments for protective paint manufacture is much larger than that of vehicles, and is not so important from the point of view of anti-corrosion. Although many workers believe certain pigments—for example, red lead—to have special anti-corrosive properties, this is doubtful. Certain pigments admittedly have anti-fouling properties—*i.e.*, prevent damp rot and growth of barnacles on ships—but the prevention of organic growth is very different from the purely chemical matter of rusting. The pigment chosen must have good covering power and give a good body to the paint, and preferably should function as a drier. Two coats of paint are usually given to iron work, the primary coating containing a pigment chosen for the good adhesive and covering properties which it gives to the paint, while the top coating usually contains a pigment selected with some regard to colour and the ability to endow the paint with great toughness and power of resisting atmospheric influences. The pigment in the primary coating must, of course, be inert as regards iron. The top coating is generally laid on thinly, and this may be assisted by diluting the vehicle with a volatile liquid such as turpentine. Suitable pigments for the first coating are red lead and iron oxide, and for the final coating white lead, zinc white, iron oxide, and graphite.

Red lead is fundamentally lead tetroxide ($Pb_3O_4$), but the commercial product usually contains, in addition, a quantity of lead monoxide (litharge). It is prepared by roasting metallic lead in air. It should be free from metallic lead and insoluble matter such as brick dust and barytes, and ought to have a deep orange-red colour. If pale in colour, this may be due to gypsum; if very yellow in colour, it probably contains an undue proportion of litharge (over 30 p.ct.).

White lead consists of a basic carbonate of lead, and has the approximate formula $2(PbCO_3)Pb(OH)_2$. The best material is still prepared by the old Dutch process, which was first recorded in 1622, in spite of the fact that no fewer than 36 different methods have since then been in use—and many more proposed. This is one case in which "new-fangled" methods are at a loss. Good white lead is very heavy, pure white, and readily pulverulent. It is completely soluble in dilute nitric acid or vinegar (acetic acid). Adulterants such as barytes, gypsum, or china clay, do not dissolve and thus may be detected. White lead is an excellent pigment, its only fault being that it darkens with sulphuretted hydrogen. This, of course, takes place more readily in places like gas-works, where there is more sulphuretted hydrogen in the atmosphere.

The oxide of iron used may be either the natural ore—*i.e.*, simply crushed hæmatite—or the artificially prepared oxide. The composition is variable, according to the source, but usually contains at least 80 p.ct. of $Fe_2O_3$, the remainder being silica, clay, &c. Hydrated oxides of iron, such as limonite or yellow ochre, although valuable decorative pigments, should not be used for iron preservation.

Zinc white (zinc oxide) is prepared by burning zinc in air; and although its properties as a pigment are not so good as those of white lead, it has one great advantage over the latter in that it is not tarnished by sulphur compounds. It should contain not more than 2 p.ct. of moisture and should dissolve completely in dilute acids.

Graphite has a property possessed by no other pigment—it is not influenced by the action of any acid or gas whatsoever. Yet it has not much application as a pigment. We ought, however, to remember its domestic use as blacklead.

## Tar for Painting.

We must not omit to consider the use of tar for painting iron. This is done in certain cases where oil paints prove too expensive—*e.g.*, coating iron pipes to be laid underground, and sheet-iron flues. Coal tar pitch is dissolved in benzene, petroleum, or coal tar naphtha, and the resulting varnish constitutes a cheap protection against rusting. The danger accompanying the use of pitch lies in the possible presence of traces of tar acids and moisture. Corrosion may commence underneath the tar coating. This is more likely to happen if a soft pitch be employed in making the varnish, as in that case less of the tar (including acids) has

been distilled; on the other hand, a very hard pitch is liable to chip off the iron when the varnish is hard dry. To neutralize any possible acidity, lime is sometimes added, and I understand that this gives excellent results.

There is no doubt that a tremendous amount of money is wasted in attempting to protect ironwork—wasted because the primary painting was inefficiently carried out. The Government authorities of the different countries have, for a long time, realized the importance attached to the efficient painting of ironwork, and have issued specifications relating to the different paint materials to be used on public structures, and the method of application to be employed. However, in this, as in most other things, there is often a considerable difference between the theory (if I may call it so) and the actual practice. Although a dry surface is always stipulated, the question arises, How thoroughly is this done? The first coating is of paramount importance. The iron must be clean and dry before painting; any rust already formed should be removed by scouring with wire brushes. Sometimes dilute hydrochloric acid is used for this purpose, but this is a dangerous practice, as, unless every trace of acid be washed away, corrosion will certainly follow. The faulty drying of the surface constitutes one of the chief obstacles in the path of successful protection, because very few workmen understand the meaning of a dry surface, in the chemical sense. The film of moisture which is deposited on most bodies in damp air very often passes unobserved, but ought to be removed before painting commences. The most efficient way of doing this would seem to be by heating the iron with blowlamps (as in removing old paint from woodwork) and laying on the first coat while the iron is still warm.

For the painting of railway bridges in this country, I have been informed that the two chief paints used are oxide of iron and black varnish. Red lead is only employed where corrosion has already set in—the final coat being oxide of iron. The varnish is used on the parts not visible to the public, and, in the case of the Forth Bridge, for example, on the ironwork exposed to the water.

### Discussion.

Mr. D. YULE (Alloa) said he thought it proper to make reference to the loss the Association had sustained by the death of Mr. Harry Gourlay, of Markinch. They had lost a staunch supporter of the Association.

Continuing, Mr. Yule observed that few industries were immune from corrosion difficulties, and the Gas Industry was no exception. Even those on the gas supply side could give a formidable list of problems arising within their own work. One might refer to the corrosion of parts due to the moist products of combustion. Then there was the external and internal corrosion of mains and services. There were three different ways of dealing with the problem—removal of the agent which caused the corrosion; selection of materials which offered greater resistance; and the protective coatings mentioned by Mr. Alexander. With certain exceptions they found the first method was the best. Unless water vapour was present, the corrosion would be practically *nil;* and they must agree with Mr. Alexander that if they could remove water vapour they would largely eliminate corrosion troubles. In regard to suitable materials, they had at present useful alloys of iron, copper, nickel, chromium, &c., but they would require very low-priced alloys to meet the needs of the Gas Industry. He had noticed that a new paint had been brought out for application to iron and steel. It was known as "Nust," and it was stated that a single coating would completely protect those metals against rust by corrosion from the atmosphere, sea water, smoke, or acids. It was applied by means of a brush to the clean surface of the metal (see "JOURNAL" for March 11, 1931, p. 646).

Mr. J. W. NAPIER (Alloa) said that when they considered to what extent the construction of gas-works was made up of ironwork, they realized that its protection was a very important matter indeed. Mr. Alexander had stated that a tremendous amount of money was wasted in attempting to protect ironwork. Looking back over the years, that had been his (the speaker's) experience, and undoubtedly the first coat of paint determined the life of the structure in many instances. He had experience of the painting of corrugated sheets which were in as good condition to-day as when they were first painted seventeen years ago. That was due to the quality of the paint used and the way it was applied.

They were all aware of the trouble which arose from gasholders; and when they considered the bad effects of moisture, it appeared to him that the painting of these structures under wet weather conditions was fatal to their after life. The structure they had visited that afternoon carried with it a very important lesson. The Forth Bridge structure, which had been in use for 40 years and was under the surveillance of one of their greatest Railway Companies, was being protected to-day by an oxide iron paint. The cost to the Railway Company of the painting of the Bridge was no less than £20,000 for three years—evidence that the Railway was satisfied that the paint was the best protective medium and was satisfied with its value. The characteristics of the Forth Bridge were peculiar to itself. It was open to the wind and water at all times, whereas the ironwork of gas-works was open to chemical attack. On account of this difference there had been a tendency in recent years to depart from the oxide iron paint and obtain other bases—graphite, aluminium, &c.—and he was satisfied that the latter class of paint was to be preferred.

Mr. Alexander had not referred to paint used for the protection of purifier lutes and the lutes of gasholders. In these particular cases they had the action of the gas occurring on the iron, and no ordinary paint would do at the wind and water level. What was known as grease paint was the best, and in his view was necessary. This grease paint never dried, and it prevented the percolation of water into the ironwork. Mr. Napier said he had absolute evidence that this particular paint was the best possible to use at the wind and water level. On this matter he was able to speak from 20 years' experience; and he could point to purifier lutes as good to-day as they were at the first, through the use of this paint. The subject was of very real importance. It was of economic importance; and while they were inclined to give more attention to the artistic effect as regards colour, this was a question which required more investigation than it had had in the past. The painting of ironwork structures in gas-works demanded a better scientific understanding than had been the case in the past. It appeared to him that they were too apt to accept paints as they were offered to them at their money value; and he suggested that more attention should be given to the constituent value having regard to the efficiency of the paint.

Mr. J. M. DOW (Perth) thought that Mr. Alexander had paid insufficient attention to coal tar products for use as protective media; and he (the speaker) would like to know what effects the acids in coal tar had on iron. There were suitable alloys coming on the market which were practically non-oxidizable. He noticed that a form of ingot iron had been introduced, and this was being used a good deal. This ingot iron was supposed to withstand atmospheric effects. Could stove paints or enamels be obtained from coal tar products?

Mr. D. CAMPBELL (Kelty) asked what class of paint Mr. Alexander would recommend for steelwork at 500° to 600° C.

Mr. SMITH (Dunfermline) asked the author what proportion of lime should be added to coal tar products used for preservation purposes. Mr. Dow had mentioned ingot iron. At Dunfermline they had trouble with a tar still, and at the place of contact they found the metal completely eaten away by tar acids. They had a ring (ingot iron) welded on the still, and they had had no trouble during the past three years. In that time they put through the still 700,000 gallons of tar.

Mr. NAPIER asked whether Mr. Alexander was satisfied that chemical analysis of paint submitted to him would enable him to satisfy the engineer as to its complete suitability for the painting of steel structures.

Mr. D. GARRIE (Burntisland) inquired whether, in view of the ease with which paint constituent materials could be adulterated without detection, Mr. Alexander considered it practicable and economical for a small user to endeavour to manufacture his own paint requirements.

### THE AUTHOR'S REPLY.

Mr. ALEXANDER said he considered that in the production of suitable alloys lay the solution of the corrosion problem, but admittedly much work had yet to be done along this line. The waste of iron due to rusting amounted to hundreds of thousands of tons annually, and unless the problem was solved the "Iron Age" must soon come to an end. In this connection one must observe that, while iron formed 4 p.ct. of the earth's crust, aluminium accounted for 7 p.ct.—nearly twice as much. In spite of the fact that the bulk of the 7 p.ct. could not at present be worked (being clay), one could see the rapid approach of the "Aluminium Age." Thus, perhaps, research ought to be concentrated on aluminium production and the manufacture of non-corroding aluminium alloys. Mr. Yule's observation in regard to the expense of suitable materials would be removed by increased aluminium production. He had no experience of the paint "Nust" mentioned by Mr. Yule. With regard to Mr. Napier's preference for ground metal base paints, while such paints were perfectly satisfactory, he knew of no conclusive evidence of their superiority over the oxide base type. In his opinion the base was relatively unimportant—it was the oil which protected. He thought Mr. Napier's finding in regard to grease paint bore this out. He had no experience of this paint, but it would seem to consist largely of a non-drying oil. As to the value of chemical analysis in determining the suitability of a paint, the answer must be that it was sufficient in itself provided no ingredients, new to the experience of the analyst, were encountered during the course of the analysis. Experimental painting alone could decide in such a case. In reply to Mr. Dow's question as to the action of tar acids on iron, certainly no phenol or cresol compounds were found. The acid was to be deprecated because, in presence of water, it increased the hydrogen ion concentration. This applied to any acid, and, in accordance with the acid theory of rusting, the smallest trace was sufficient to cause the corrosion of an unlimited amount of metal. He had no experience of ingot iron. Stoving blacks, usually made with stearin pitch, might possibly be made with coal tar pitch. Mr. Campbell had asked for a paint to apply to steelwork to withstand a temperature of 500° to 600° C. Probably a black varnish was the best to apply in this case. It was undoubtedly necessary to neutralize the acidity of coal tar before coating iron, and lime would seem to be the most suitable material to add. Mr. Smith asked for the quantity. This, of course, depended on the amount of the acid present. It might perhaps be 12 p.ct. for a tar and 1 p.ct. for a pitch. A slight excess would do no harm. It would seem to be quite practicable for the small consumer to mix his own paint. Mr. Garrie mentioned red lead and linseed oil in his question. These two ingredients were particularly easy to mix, so possibly the use of a paint mixer could be dispensed with.

# Woodall-Duckham Vertical Retort Plant at Tredegar

Described by D. WALTER DAVIES, M.Inst.Gas E. (Engineer and Manager to the Tredegar Gas Department).

**[These works were visited by the Wales and Monmouthshire Junior Gas Association on April 11]**

Prior to the installation of vertical retorts, the carbonizing plant consisted of forty-four 22 in. by 16 in. by 10 ft. hand-charged stop-ended horizontal retorts in two houses, one containing two settings of 6 and the other four settings of 8 retorts. The annual make having risen to 70 million c.ft., with a maximum day's output of 315,000 c.ft., the question of modernizing the carbonizing plant became urgent. A close study was made of modern carbonizing systems and installations of machine-charged horizontal retorts and continuous vertical retorts were visited. As a result, an order for a battery of continuous vertical retorts was placed with the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd.

The results obtained with the old settings for the year ended March 31, 1928, may be of interest, illustrating as they do the high labour costs involved.

| | |
|---|---|
| Gas made | 69,806,100 c.ft. |
| Coal used | 4888 tons |
| Yield of gas per ton of coal | 14,281 c.ft. |
| Coke for sale per ton of coal | 9½ cwt. |
| Tar produced per ton of coal | 8¼ gallons |
| Quantity of coal charged per man per shift | 37 cwt. |
| Carbonizing wages | 6d. per 1000 c.ft. |
| " " | 7s. 2d. per ton of coal |

## VERTICAL RETORT PLANT.

The Woodall-Duckham installation erected in 1929 consists of one bench of six 53-in. retorts set in single units and heated by means of two producers situated at the retort house floor level at one side of the bench. The silica retorts are about 25 ft. high and of rectangular tapered shape, the width of the top being 10 in. They are heated by way of vertical combustion chambers built at each side of the retort, additional secondary air inlets being provided at some distance above the main nostrils to enable the zoning of the heats to be capable of variation to suit the type of coal carbonized and to control the calorific value of the gas made.

The plant, which embodies the latest principles of the Woodall-Duckham system, was installed for a daily output of 432,000 c.ft. of gas of a calorific value of 450 B.Th.U. The installation is of special interest as being the first upwardly heated setting of Woodall-Duckham vertical retorts erected in this country, though upward heating had been employed on some continental installations. Upward heating was adopted to enable a heating schedule specially suitable for fine highly swelling coals to be realizable. Provision has been made for future extensions, and when the demand for gas increases the carbonizing plant can be extended by one third, by the addition of two retorts.

The installation is arranged with straight joints and cavity walls between the retorts, each of which is absolutely separate from the next, so that any one retort may be heated up, cooled down, or scurfed without in any way interfering with the working of the other retorts. The producers are so arranged that the gas from either producer may be taken to the heating flues of any of the retorts and are large enough to serve for the firing of two additional retorts.

## COAL HANDLING.

Coal is discharged by hand from wagons into a small receiving hopper arranged at rail level. From this hopper the large coal can be fed into a two-roll breaker by means of a jigging feeder fitted with a screen through which the small coal passes direct into a by-pass chute delivering into the delivery chute underneath the bunker. The coal is then fed to an elevator which delivers into overhead storage hoppers of 48 hours' capacity above the retort bench. From the storage hoppers the coal is fed through special valves into auxiliary supply hoppers fixed to the top mouthpieces of the retorts. From the auxiliary coal hoppers the coal falls by gravity into the retorts at a speed governed by the rate at which the coke is extracted from the bottom.

## COKE.

The residual heat of the coke is utilized for the formation of water gas within the retorts. To this end, steam is introduced through nozzles fitted into the curved bottom plate of the coke extractor box. The coke is thus discharged dry and cool without smoke or dust.

The successful working of the retorts depends on an efficient system of coke extraction which must ensure regular, even discharge of the coke without causing cutting or shearing. Moreover, the rate of coke extraction must be capable of being altered at will without difficulty. Uniform extraction is secured by use of an extractor roll consisting of a series of cast-iron stars mounted on a square shaft, each star having a slight lead on its neighbour so that in effect a helix is formed. A simple movement of an adjustable clamp on the reciprocating driving bar which operates the extractor wheel enables the speed of extraction to be altered over the whole range from zero to maximum extraction.

A cast-iron hopper beneath the extractor receives a two hours' make of coke which is removed by opening a water-sealed gas-tight door situated at the bottom of the hopper. The coke is discharged either into a specially designed side-discharging skip running on steel rails laid on the floor of the retort house, or into a mild steel barrow running on this floor. To provide the coke required by the producers, the skip is run into a 25-cwt. steam engine driven lift and elevated to the producer charging platform level. It is then run out from the lift on to cast-iron plates laid on top of the producer brickwork, the coke being discharged direct from the skip into the charging holes of the producers as required.

Surplus coke is taken, by means of the same lift, to an overhead gantry and discharged into railway wagons or to stock.

## WASTE-HEAT RECOVERY.

The major portion of the heat contained in the waste gases leaving the setting is recovered by means of a waste-heat boiler of the vertical fire-tube type capable of working on the waste gas from eight retorts and of giving an output of 2600 lbs. of steam per hour at a pressure of 100 lbs. per sq. in. With six retorts at work sufficient steam for the usual requirements of the works can be raised from the waste gases alone, but if necessary this supply can be augmented by utilizing the arrangement whereby an auxiliary supply of producer gas can be burnt in the mixing chamber of the boiler.

The boiler is provided with the necessary mountings, including a high and low water level alarm, and is well insulated to secure maximum efficiency. The inlet chamber of the boiler is filled with chequer brickwork to form a radiating chamber, and the outlet chamber is provided with hinged doors containing plugged cleaning holes so that the tubes may be cleaned while the boiler is working. A single-cylinder, direct acting horizontal water pump provides feed water for the boiler, and, as a stand-by in case of a breakdown of the pump, an automatic injector is provided.

## ACTUAL RESULTS.

Actual results obtained from the plant, for the twelve months ended March 31, 1931, from a local coal with a volatile content of but 18/20 p.ct., are as follows:

| | |
|---|---|
| Gas made (not corrected) | 81,977,400 c.ft. |
| Coal used | 4994 tons |
| Yield of gas per ton of coal | 16,415 c.ft. |
| Therms per ton of coal | 75·33 |
| Coke and breeze for sale per ton of coal | 11¼ cwt. |
| Tar produced per ton of coal | 4·35 gallons |
| Quantity of coal charged per man per shift | 91 cwt. |
| Carbonizing wages | 2¾d. per 1000 c.ft. |
| " " | 3s. 9d. per ton of coal |

Actual results, compared with Woodall-Duckham guarantees, so far as throughput is concerned, are as follows:

| — | Actual. | Guarantees. |
|---|---|---|
| Throughput of coal per retort per 24 hours, tons | 5½ | 4 |
| Make of gas per retort per 24 hours, c.ft. | 90,200 (Uncorrected) | 72,000 (Corrected) |

## PRICE OF GAS.

The outsider finds it difficult, if not altogether impossible, to check statements like the foregoing, and they are, consequently, often taken with the proverbial grain of salt; but, in the majority of cases, the cost of production should be more or less corroborated by the selling price, and so far as Tredegar is concerned this is so, as will be seen by the following:

| | |
|---|---|
| Net price to all ordinary consumers, whether large or small | 8½d. per therm |
| Net price to all prepayment consumers | 22 c.ft. a penny |

# Scottish Junior Gas Association

## Eastern and Western Districts Visit the Grangemouth Refinery of Scottish Oils, Ltd.

A joint visit of the Eastern and Western Districts of the Scottish Junior Gas Association to the Grangemouth Refinery of Scottish Oils, Ltd., was made on March 7. The party were received by Mr. Annan, Works Manager.

### Description of Works.

The erection of the refinery at Grangemouth was begun in 1921, and the plant was brought into operation two years later. The crude oil to be refined is brought from Persia in tankers carrying about 10,000 tons each, which discharge their cargoes at a private berth in the Eastern Channel of Grangemouth Harbour, where cargoes are regularly handled at the rate of 400 tons per hour. From this point a series of pipelines carries the oil to tankage near the refinery, from which supplies are drawn for the daily throughput of the refinery at Grangemouth and for a smaller unit at Uphall fourteen miles away. A large proportion of the products of the refinery is shipped to foreign markets through the same berth, and the traffic has expanded to such an extent within recent years that it has become necessary to duplicate the accommodation, and a second berth is now approaching completion. To handle this inwards and outwards traffic, tankage having a total capacity of over 100,000 tons has been erected. At the refinery the crude oil passes through a primary distillation in a bench of five cylindrical stills similar in design to Lancashire boilers, but fired by gas from producers, two of which serve each still. These stills are operated continuously and in series and have very complete equipment of heat-exchange arrangements—*e.g.*, the hot residue drawn from the last still in the series passing through a preheater in counter-current to the incoming crude oil distils a considerable percentage of the lighter constituents. To enable the throughput at this stage to be further increased, a pipe still has lately been brought into use in series with the original cylindrical stills.

The products from this stage are the light spirit from the pipe-still and preheater, a distillate consisting of kerosene and spirit from the cylindrical stills, and a residue very suitable for use as fuel oil. The fuel oil, consisting of the residue from the primary bench, receives no further treatment, but the distillates, in addition to accurate fractionation by steam distillation when necessary, are treated chemically to bring them to market standards of colour, &c. The reagents employed are caustic soda and sodium hypochlorite (both produced on the spot) in the case of spirit, and caustic soda and oleum, supplemented by sulphur dioxide and bauxite, in the case of kerosene. The chemical treatment of the distillates actually commences at the primary stills where the vapours are washed with soda. The object of the bauxite treatment is the removal of certain constituents harmful in respect of the colour and smell of the finished product, and it also removes traces of moisture from the oil which would interfere with the subsequent treatment with sulphur dioxide. The bauxite is applied by allowing the kerosene to filter through a 20-ft. column of the material previously reduced to suitable size and roasted at a prescribed temperature.

The activity of the bauxite diminishes in use, and when its efficiency has fallen to a certain level it is withdrawn from the filter and returned through a rotating furnace which restores it to the original standard. This operation can be repeated indefinitely, the only loss being due to the dust produced by attrition, which is blown away in the process of preparation. The treatment with sulphur dioxide is applied under pressure sufficient to maintain the reagent in the liquid form, and by subsequent reduction of pressure the reagent is removed as a gas to be re-compressed and returned for further use in a continuous cycle of operations. This treatment produces a burning oil of unequalled quality in consequence of the elimination of all undesirable constituents.

The chemical treatments with soda, hypochlorite, &c., are applied partly in vessels fitted with mechanical agitators and partly by inducing turbulent flow of the product and reagent in the course of its transfer by pipeline from one point to another in the refinery.

Electricity for light and power is provided by large turbo-generators, supplied with steam by Thomson boilers fitted with chain grates.

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After the inspection the members were entertained at tea.

Mr. D. Melvin (President of the Western District) and Mr. D. Yule (President of the Eastern District) expressed the thanks of the members for the facilities offered by the Company.

A hearty vote of thanks was then accorded to Mr. Annan and the guides.

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## Corrosion of Buried Steel.

A meeting of the London Section of the Society of Chemical Industry was held at Burlington House on Monday, April 13—Prof. G. T. Morgan, F.R.S., in the chair. One of two papers presented was by Mr. F. L. Bassett, F.I.C., Government Chemist, Iraq, on "Some Factors Affecting the Corrosion of Buried Steel." It was read, in the absence of the author, by Mr. W. J. A. Butterfield.

The paper was a contribution to the study of the controlling factors in the attack on welded and seamless mild-steel pipe when buried in soil. The investigation originated in a proposal to lay several hundred miles of pipeline through the Iraq-Syrian desert, where the soil varied in character, but consisted essentially of marls and calcareous clays, with more or less sand, and chloride salinity ranging from *nil* to the equivalent of 27·8 p.ct. of common salt. They were all sub-alkaline. Eighty samples of soil in all were studied in relation to two very similar brands of mild-steel piping. Strips of the steel, each 1 by 6 in. and of uniform thickness, were prepared from the piping, in sufficient numbers to admit of a weighed strip of each brand being inserted to a depth of 3 in. in three portions of each sample of soil, in which the strips were left, for periods of one, two, and three months respectively, at an equable temperature and similar moistness of the soil. At the end of each period the extent of the attack of the steel was ascertained by de-rusting the strips and re-weighing. It was found that the maximum corrosion of the steel was afforded by the soils which were slightly saline—*i.e.*, those containing the equivalent of 0·01 to 0·2 p.ct. of sodium chloride. While soils which were practically free from salinity were somewhat less corrosive than the above, the most marked repression of corrosion occurred with the most highly saline soils. This result appears to be correlated with the increased water-retentivity of salted soils, and the consequent hindrance of atmospheric oxygen diffusion. The corrosion took the usual course of localized anodic pitting. The observations suggest that well-compacted salty ground may provide the best conditions for minimal attack of mild steel, but, as it has hitherto been generally presumed that the most serious attack of steel pipe occurs in salty soils, it is clearly desirable to extend the present observations to investigations in the field. Such investigations have already been put in hand by the author, who hopes to report on them two or three years hence.

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## Manchester and District Junior Gas Association

The Thirty-First Annual Dinner of the Association was held at Parker's Restaurant, Manchester, on March 11. In the afternoon a cinematograph film made at the works of Messrs. W. C. Holmes & Co., Ltd., of Huddersfield, and of the Bryan Donkin Company, Ltd., of Chesterfield, and at various works where plant has recently been installed, was shown to the members of the Association.

The method of construction, erection, and principles of operation of the various plants were very clearly depicted, and the film was of exceptional interest. Several members asked for further information respecting the various plants exhibited; and Mr. C. Cooper, of Messrs. Holmes & Co., who demonstrated the film, gave the information asked for.

The President (Mr. C. H. Bamber) moved, and Mr. A. K. Collinge (Preston) seconded, a vote of thanks to Mr. Cooper and the firm.

After a short interval the members sat down to dinner, after which the usual toasts were given and replied to.

The special guests of the evening were: Mr. W. J. Smith (Bolton), Mr. Walker (Messrs. R. & J. Dempster, Ltd., Manchester), the President and Hon. Secretary of the Yorkshire Junior Gas Association, Mr. Young (Messrs. Newton, Chambers, & Co., Ltd.), and the Hon. Secretary of the Manchester District Institution of Gas Engineers.

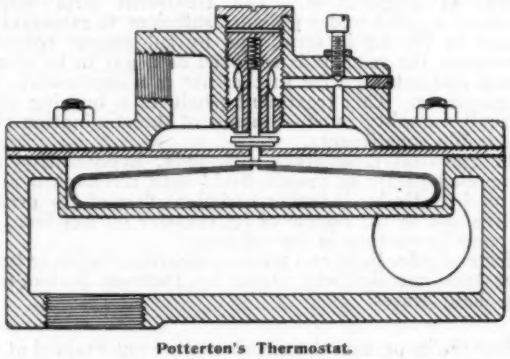
# REGISTER OF PATENTS

## Thermostats.—No. 344,597.

POTTERTON, A. B., POTTERTON, T. F. C., and THOMAS POTTERTON (HEATING ENGINEERS), LTD., all of Balham, S.W. 12.

No. 1720; Jan. 17, 1930.

According to this invention, the expansive element of the thermostatic device is in the form of a flat loop made from a bi-metallic strip. The free ends of the bent loop are centrally situated with respect to the length of the loop, and the element so formed is accommodated in a recess formed in the wall of a chamber which is included in the circulation system of the water or other fluid to be heated. The recess containing the expansive element is covered over to protect the latter from the cooling influence of the gas, as by a sheet of leather or other suitable impermeable flexible material such as is used for the bellows of gas meters, which also forms a joint between the water chamber and a gas chamber through which the gas passes from the supply pipe to a burner or burners. This gas chamber has fitted within it an adjustable plug formed with a guideway for the stem of a valve which, with the plug, is centrally situated immediately over the free ends of the thermostatic device. A light spring may be provided which tends to force the valve off its seat and towards the cover which encloses the bi-metallic strip, but such a spring is not always necessary if the arrangement is such that the valve by its position is subject to the action of gravity.



Potterton's Thermostat.

Alternatively, the sheet of material separating the gas chamber from the expansive element may be a non-flexible material, and in this case it is provided with a small hole at the centre for the passage of a pin projecting upwardly from a plate which rests upon the free ends of the bi-metallic element, this pin serving to close the valve on its seat consequent on the distortion of the bi-metallic element.

The body of the adjustable plug is formed with a circumferential cavity which is in communication with the gas inlet and, through multiple longitudinal boreholes, with the inner face of the plug which constitutes the valve seat. The circumferential cavity in the body of the plug is permanently connected with an adjustable by-pass leading to a space which is in permanent communication with the gas outlet to the burner. The adjustable plug is fitted in the valve casing in such a way that it and the valve can be withdrawn simply by removing a screwed cap or plug which closes the chamber in which the plug is fitted.

The accompanying drawing is a central section of the thermostat.

## Removal of Tar Acids from Oils.—No. 344,614.

SOUTH METROPOLITAN GAS COMPANY and STANIER, H., both of Old Kent Road, S.E. 15.

No. 3357; Jan. 31, 1930.

According to this invention, phenols and other tar acids are extracted from mixtures of them with coal tar oils or other hydrocarbon oils, such as paraffins, cycloparaffins, open or closed chain unsaturated hydrocarbons and aromatic hydrocarbons, by means of organic bases which, state the patentees, have the advantage over the caustic alkali solutions hitherto used for the purpose that it is not necessary to use them in aqueous solution (so that tendency towards emulsification may be minimized), and that they do not require to be neutralized in order that the tar acids may be liberated.

The organic bases in question may be defined as bases which are substantially insoluble in hydrocarbon oils and can be produced by interaction of an alkylene oxide with ammonia, or, in the form of hydrochlorides, by interaction of an alkylene chlorhydrin with ammonia.

Typical bases for use in the invention are the mono-, di-, and tri-ethanolamines to which are generally ascribed the following formulæ respectively: $HO.C_2H_4.NH_2$; $(HO.C_2H_4)_2NH$; $(HO.C_2H_4)_3N$.

Tri-ethanolamine is particularly suitable, and according to one way of carrying out the invention, a crude tar distillate is shaken with commercial tri-ethanolamine; the tar acids are extracted; and on separation of the base extract the tar acids can be liberated by dilution with water. The diluted mixture is preferably saturated with a gas containing carbon dioxide, to obtain a more complete separation by formation of the base carbonate. The tar acids separate in conjunction with a quantity of hydrocarbon oils which have dissolved in the base extract. The aromatic and unsaturated hydrocarbons are more soluble in the base extract than the open chain fully saturated hydrocarbons, and in the case of aromatic tar oils the quantity of dissolved hydrocarbons can be minimized by dilution of the aromatic tar oil with a petroleum oil before extraction with the base. If desired, the dissolved hydrocarbon oil can be removed from the extract before dilution by distillation in a current of inert gas, or, if this is not possible owing to the high boiling point of the dissolved oil, by extraction with a solvent immiscible with the extract.

The recovered phenols are completely freed from base by further extraction with water and saturation with a gas containing carbon dioxide. The free base can be regenerated for re-use by concentration of the base carbonate solution to remove the water and carbon dioxide.

When the crude oils are deeply coloured with resinous impurities, the colour of the hydrocarbon oils is materially lightened by the treatment, the coloured impurities being concentrated in the tar acid-base extract.

## Clockwork Gas Controllers.—No. 344,941.

HORSTMANN GEAR COMPANY, LTD., and HORSTMANN, A., both of Bath.

No. 38,411; Dec. 16, 1929.

This invention has reference to clockwork gas controllers wherein the operation of the gas cock is effected by tappets adjustably arranged on a rotating dial plate carried by clockwork mechanism, which engage, either directly or indirectly, levers associated with the cock. An object is the provision of a simple means for effecting partial rotations of the plug of the gas cock so that the "on" tappet of the rotating dial plate cannot turn the gas off, nor can the "off" tappet of the said dial plate turn the gas on; and should an attendant inadvertently leave the gas burning when it should be off, such as after testing a mantle, the sequence of operations will not be reversed on this account.

Another object is to enable the use of a simple pair of levers which are connected with one another so that each not only performs its function of turning the cock into the "on" or "off" position, but simultaneously moves the other lever into tappet engaging position, itself remaining outside the tappet path. At no time, therefore, are the two levers at rest together in the tappet path (or in the path of any intermediate tappet-operated device), while always the next lever in sequence ("on" or "off") will have been definitely moved by its companion lever into operative position, without depending on springs, gravity, or other extraneous force.

A pair of gas-cock operating levers are interconnected so that each turns the cock in one particular direction ("on" or "off"), passing and remaining out of the tappet path, while at the same time each turns the other lever in the reverse direction into the tappet path. This is best carried into effect by constructing one lever fixed to and adapted to turn the plug in one direction, the other being pivotally connected to the body of the gas cock, and interconnected to the first mentioned lever, such as by a pin and slot-like connection, to turn the plug in the opposite direction.

Thus, when the one lever is acted upon by the one tappet of the rotating dial plate to impart a partial rotation of the plug in the one direction, the other lever is automatically moved into correct position to be actuated by the other tappet of the rotating dial to impart a partial rotation of the plug in reverse direction, although the tappets both operate in one and the same direction.

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# Parliamentary Intelligence

[From Our Special Correspondents.]

## House of Commons.

**London Passenger Transport Bill.**

Petitions against the Bill have been presented by the Gas Companies' Protection Association and the National Gas Council. These have been referred to the Joint Committee on the Bill.

**Edinburgh Gas Order.**

A Provisional Order, entitled the Edinburgh Corporation Transport Gas and Finance (Consolidated and Amendment), &c., Order, has been deposited under the Private Legislation Procedure (Scotland) Act, by Messrs. Beveridge & Co.

**Special Orders.**

An Order made on the application of the Stroud Gas Light and Coke Company has been presented, and ordered to lie upon the Table.

Plans have been deposited in connection with the Wantage Gas Order.

**Price of Coal.**

Mr. Albery, the Member for Gravesend, has given notice to ask the Secretary for Mines if he can state approximately to what extent there has been a rise in the price of coal to gas undertakings during the last few months.

## Gas Acts (1920 and 1929) Orders.

**SPECIAL ORDERS.**

**Holywell and Flint Gas.**

To authorize the British Gas Light Company, Ltd., to acquire the gas undertaking of the Flint Gas and Water Company, Ltd.

## Trade Notes.

**Gasholder for Colliery Company.**

The Whessoe Foundry and Engineering Company, Ltd., of Darlington, have secured a contract from the Blackwell Colliery Company for a small column-guided gasholder of a capacity of 100,000 c.ft.

**Smiths' Hearths and Blowing Fans.**

A catalogue has recently been issued by Messrs. James Keith & Blackman Co., Ltd., of 27, Farringdon Avenue, E.C. 4, describing their various designs of smith's hearths and small electric blowing fans. The firm are ready at all times to prepare schemes for blowing smithy fires either by individual fans, as described in the present catalogue, or through blast mains; and also for smoke exhaust plants.

**Diesel Engines for B.B.C. Falkirk Station.**

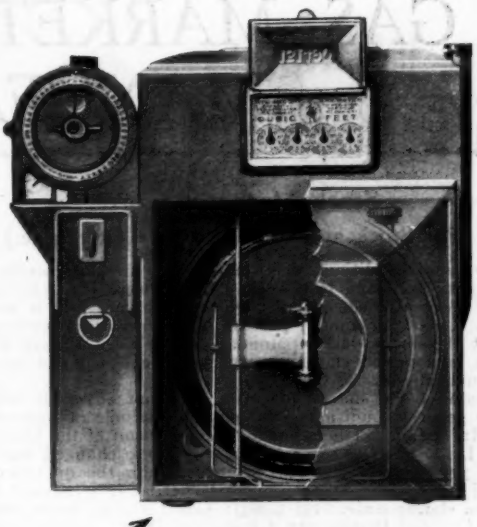
The B.B.C. has just placed an order with Messrs. Crossley Brothers, Ltd., of Manchester, for four 350-B.H.P. vertical oil engines, which are to be installed in the new Scottish Regional Station at Falkirk, the latest of its type. These new Crossley engines, with a total of 1400 B.H.P., represent the latest development in vertical compressorless Diesel engine design. Many installations have now been put down in various parts of the country and of the world, all giving great satisfaction.

**Daniel Adamson Superheaters.**

A new catalogue (publication No. 202) has recently been published by Messrs. Daniel Adamson & Co., Ltd., of Dukinfield, dealing with the various types of superheaters manufactured by them. The firm realize the enormous fuel saving that can be obtained by the adoption of superheaters, and the range of types produced has developed with the result that they offer to clients the design that is best suited to their needs, whether it is in connection with an existing boiler plant or a new installation, and for moderate or high degrees of superheat.

**Simon-Carves, Ltd., Move to Cheadle Heath.**

The building in Mount Street, Manchester, which has been occupied for over forty years by Messrs. Simon-Carves, Ltd., has been purchased from them by the London, Midland, and Scottish Railway Company for an extension to the Midland Hotel, and they have now vacated the premises. Extensive new offices, drawing offices, and laboratories for the accommodation of the whole of Messrs. Simon-Carves' technical and commercial staffs have been built at Cheadle Heath, which lies about eight miles to the south of Manchester, and two miles from the important industrial town of Stockport. The buildings, which are situated in healthy surroundings, have been laid out on the most modern lines, and are arranged on one level so that the maximum amount of light is secured throughout. The main building is 330 ft. long and 90 ft. wide, and the laboratories and departmental stores occupy a separate block which is 150 ft. long and 50 ft. wide. Well-appointed staff dining rooms have been provided in a wing of the main building. The transfer to Cheadle Heath has now been completed, and the old offices at 20, Mount Street, Manchester, are closed. The address for all correspondence will now be "Cheadle Heath, Stockport," and the telephone number is Gatley 3600 (7 lines). The telegraphic address remains "Simcar Manchester," as formerly.



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# GAS MARKETS & MANUFACTURES

## Stock Market Report.

**[For Stock and Share List, see later page.]**

Very quiet conditions were experienced in most markets on the Stock Exchange last week. There were few sellers, and buyers were also conspicuous by their absence. It is evident that a "marking time" process is in operation pending the Budget statement due on Monday next. Even British Funds, after a long period of popularity, were neglected and recorded fractional falls on the week.

Gas stocks and shares, however, were not adversely affected by the general conditions. In fact, the volume of business increased; and it will be seen, by a comparison of the Stock and Share Lists, that in several instances stock changed hands at higher prices than last week's best, though the quotation remained unchanged. For example, Barnet, at 127½ (against 126½); Croydon sliding-scale, 110⅜ (109½); Gas Light £1 units, 18s. 9d. (18s. 6d.); and Portsmouth 4 p.ct., 126 (124). Among those to record improvements Aldershot 5 p.ct. maximum headed the list with a rise of 4 points to 77-82, yielding at this price nearly £6 6s. p.ct. Compared with other 5 p.ct. maximum stocks quoted in the List, this price is on the low side, and some further appreciation appears justified. When available a purchase at or a little above the current price should prove an attractive investment. It will be remembered that this Company supplies gas, water, and electricity, and business in all three sections is developing very rapidly—gas sales have increased by over 40 p.ct. since 1922. Another stock to improve last week was that of Hornsey consolidated, which gained 2 points to 91-94. The yield in this case, on the basis of a 6 p.ct. distribution (the rate paid for the past two years), works out at £6 9s. 9d. Alliance and Dublin and Wandsworth ordinary stocks each gained 1 point, and fractional improvements took place at the local Exchanges in Liverpool and Newcastle ordinary stocks.

The Gas Light and Coke Company's 4½ p.ct. redeemable debenture stock, now quoted in the Stock Exchange Official List, has been included in the "JOURNAL" Stock and Share List. This stock was issued in October last at 91½ p.ct. and is redeemable at par (*a*) on Jan. 1, 1965, or (*b*) earlier on Jan. 1, 1960, 1961, 1962, 1963, or 1964 on six months' notice from the Company. Interest is payable on Jan. 1 and July 1.

## Current Sales of Gas Products.

### The London Market for Tar, Tar Products, and Sulphate.

LONDON, *April* 20.

The values of tar products remain unchanged, and are as follows:

Pitch, 45s. per ton f.o.b.

Creosote, for export, 5½d. per gallon f.o.b.

Pure toluole, 1s. 11d. per gallon; pure benzole, 1s. 6d. to 1s. 7d. per gallon; 95/160 solvent naphtha, 1s. 4d. to 1s. 5d. per gallon; pyridine bases, 3s. 3d. to 3s. 6d. per gallon.

All prices of spirits are *ex* sellers' works.

### Tar Products in the Provinces.

*April* 20.

The average prices of gas-works products during the week were: Gas-works tar, 17s. 6d. to 21s. 6d. Pitch—East Coast, 42s. 6d. to 43s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 42s. 6d. to 43s. f.o.b.* Toluole, naked, North, 1s. 6¾d. to 1s. 7¼d. Coal-tar crude naphtha, in bulk, North, 5½d. to 6d. Solvent naphtha, naked, North, 1s. 2d. to 1s. 2½d. Heavy naphtha, North, 11d. to 1s. Creosote, in bulk, North, liquid and salty, 3¼d. to 3½d.; low gravity, 1¾d.; Scotland, 3¼d. to 3½d. Heavy oils, in bulk, North, 5⅝d. to 5⅞d. Carbolic acid, 60's, 1s. 1d. to 1s. 2d. Naphthalene, £10 to £12. Salts, £3 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

### Tar Products in Scotland.

GLASGOW, *April* 18.

Very little alteration can be recorded in this area. The volume of business continues moderate, but values show no appreciable change.

Pitch.—With few orders passing prices are nominal at 40s. per ton f.o.b. Glasgow for export, and about 42s. 6d. per ton f.o.r. works for home trade.

Refined tar to Ministry of Transport Specification continues in regular demand with prices unchanged at 2¼d. to 2¾d. per gallon f.o.r. makers' works naked.

Creosote.—Stocks are within bounds, and fair business is being transacted. B.E.S.A. Specification is 2¾d. to 3d. per gallon; low gravity, 3½d. to 3¾d. per gallon; and neutral oil, 3d. to 3¼d. per gallon; all *ex* works in bulk.

Cresylic.—To-day's values are lower. Pale, 97/99 p.ct., is 1s. 3d. to 1s. 4d. per gallon; dark, 97/99 p.ct., 1s. 2d. to 1s. 3d. per gallon; and pale 99/100 p.ct., 1s. 5d. to 1s. 6d. per gallon—all f.o.r. naked.

Crude naphtha.—There is a continued steady demand at 4d. to 4½d. per gallon f.o.r. in bulk.

Solvent naphtha.—Orders are scarce, but prices are unchanged. 90/160 is 1s. 2d. to 1s. 3d. per gallon; and 90/190, about 1s. per gallon.

Motor benzole is commanding very little attention at 1s. 2d. to 1s. 3d. per gallon.

Pyridines remain dull, with 90/160 nominal at 3s. to 3s. 3d. per gallon.

### Benzole Prices.

These are considered to be the market prices for benzole:

| | s. d. | | s. d. | |
|---|---|---|---|---|
| Crude benzole . . . . | 0 5½ | to | 0 6½ | per gallon at works |
| Motor ,, . . . . . | 1 0 | ,, | 1 1 | ,, ,, ,, |
| Pure ,, . . . . . | 1 4 | ,, | 1 5 | ,, ,, ,, |

## New Capital Issues.

**Barnstaple Gas Company.**—This Company raised £5000 additional capital in half-an-hour at an auction sale of shares on Tuesday, April 14. The stock offered was "B" shares of a nominal value of £10 ranking for a standard dividend of £7 p.ct., subject to a sliding scale equally with the existing shares of the same class, the dividend of which for the past year was at the rate of £9 2s. p.ct., which dividend, the auctioneer stated, had been paid for the last four years. The first sixty shares offered sold readily at £15 each, the majority of the others at £14 15s. and £14 10s., a few being secured at £14 5s.

**Redditch Gas Company.**—The tenders sent in for the £25,000 capital which were offered on behalf of this Company amounted to a total of £64,775. Those for the 5½ p.ct. redeemable debenture stock ranged from £102 15s. per £100 down to the minimum of par, the average price obtained being £102 5s. 6d. p.ct.; and for the ordinary stock from £108 per £100 down to the minimum of par, the average price obtained being £101 18s. 5d. p.ct.

## Contracts Advertised To-Day.

**Coal.**

The Directors of the Dawlish Gas and Coke Company invite tenders for the supply of coal. [Advert. on p. 233.]

The Warrington Gas Committee invite tenders for the supply of coal. [Advert. on p. 233.]

**Cookers, Fires, &c.**

The Warrington Gas Committee invite tenders for the supply of cookers and fires. [Advert. on p. 233.]

**Fireclay Goods, General Stores, &c.**

The Warrington Gas Committee invite tenders for the supply of fireclay goods and various stores. [Advert. on p. 233.]

**Gasholder.**

The Dumfries Gas Department invite tenders for the erection of a gasholder. [Advert. on p. 233.]

**Meters.**

The Warrington Gas Committee invite tenders for the supply of meters. [Advert. on p. 233.]

**Oxide, &c.**

The Warrington Gas Committee invite tenders for new or spent oxide. [Advert. on p. 233.]

**Pipes, Valves, and Lighting Goods.**

The Warrington Gas Committee invite tenders for pipes, valves, gas fittings, mantles, &c. [Advert. on p. 233.]

**Tar Stills.**

The Warrington Gas Committee invite tenders for the supply of tar stills. [Advert. on p. 233.]

# STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

| Issue. | Share. | When ex-Dividend. | Dividends. Prev. Hf. Yr. | Dividends. Last Hf. Yr. | NAME. | Quotations. Apl. 17. | Rise or Fall on Week. | Transactions. Lowest and Highest Prices During the Week. |
|---|---|---|---|---|---|---|---|---|
| £ | | | % p.a. | % p.a. | | | | |
| 171,978 | Stk. | Feb. 5 | 5 | 5 | Aldershot 5 p.c. max. C. ... | 77—82 | +4 | 77½—80½ |
| 522,992 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref. ... | 75—80 | ... | ... |
| 1,551,868 | ,, | Apl. 9 | 7⅞ | 7⅞ | Alliance & Dublin Ord. ... | 98—103[t] | +1 | 100—101½ |
| 374,000 | ,, | Jan. 8 | 4 | 4 | Do. 4 p.c. Deb. ... | 70—75 | ... | ... |
| 522,655 | ,, | Mar. 5 | 7 | 7 | Barnet Ord. 7 p.c. ... ... | 124—129 | ... | 127½ |
| 300,000 | 1 | Oct. 23 | 1/7½ | 1/4½ | Bombay, Ltd. ... ... | 16/—18/- | ... | 16/6—17/- |
| 174,500 | 10 | Mar. 5 | 9 | 9 | Bournemouth 5 p.c. ... | 15—16 | ... | ... |
| 500,050 | 10 | ,, | 7 | 7 | Do. B 7 p.c. ... | 12½—13 | ... | ... |
| 439,160 | 10 | ,, | 6 | 6 | Do. Pref. 6 p.c. ... | 11⅛—11⅝ | ... | ... |
| 50,000 | Stk. | Dec. 18 | 3 | 3 | Do. 3 p.c. Deb. ... | 60—63 | ... | ... |
| 162,025 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb. ... | 81—84 | ... | ... |
| 357,900 | ,, | Mar. 19 | 7½ | 7½ | Brighton & Hove 6 p.c. Con. | 112—117 | ... | ... |
| 371,880 | ,, | ,, | 6¾ | 6¾ | Do. 5 p.c. Con. | 102—105 | ... | ... |
| 1,287,500 | ,, | Feb. 19 | 5 | 5 | Bristol 5 p.c. max. ... ... | 94½—95½[a] | ... | ... |
| 120,420 | ,, | Dec. 18 | 4 | 4 | Do. 1st 4 p.c. Deb. ... | 78—80[e] | ... | ... |
| 217,870 | ,, | ,, | 4 | 4 | Do. 2nd 4 p.c. Deb. ... | 78—80[e] | ... | ... |
| 328,790 | ,, | ,, | 5 | 5 | Do. 5 p.c. Deb. ... ... | 99½—100½[a] | ... | ... |
| 855,000 | ,, | Apl. 9 | 7 | 8 | British Ord. ... ... ... | 109—114[t] | ... | 111—112⅞ |
| 100,000 | ,, | Dec. 18 | 7 | 7 | Do. 7 p.c. Pref. ... ... | 109—114 | ... | ... |
| 120,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Red. Deb. ... | 74—77 | ... | ... |
| 450,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 92—97 | ... | ... |
| 160,000 | ,, | Jan. 8 | 5 | 5 | Cambridge 5 p.c. Deb. ... | 95—98 | ... | ... |
| 100,000 | 10 | Dec. 4 | 10 | 6 | Cape Town, Ltd. ... ... | 9½—10½ | ... | ... |
| 100,000 | 10 | Nov. 6 | 4½ | 4½ | Do. 4½ p.c. Pref. ... | 6½—7½ | ... | ... |
| 150,000 | Stk. | Dec. 18 | 4½ | 4½ | Do. 4½ p.c. Deb. ... | 72—77 | ... | ... |
| 626,860 | ,, | Feb. 19 | 6 | 6 | Cardiff Con. Ord. ... ... | 96—99 | ... | ... |
| 237,860 | ,, | Jan. 8 | 7½ | 7½ | Do. 7½ p.c. Red. Deb. ... | 97—100 | ... | ... |
| 157,150 | ,, | Feb. 19 | 5 | 6¼ | Chester 5 p.c. Ord. ... ... | 85—90[b] | ... | ... |
| 98,936 | 1 | Oct. 9 | 1/- | 1/- | Colombo, Ltd. Ord.... | 29/—34/- | ... | ... |
| 24,500 | 1 | ,, | 1/4½ | 1/4½ | Do. 7 p.c. Pref. | 18/—20/- | ... | ... |
| 669,204 | 1 | Apl. 9 | 1/4½ | 15/27½[d] | Colonial Gas Assn. Ltd. Ord. | 16/—18/-[e] | ... | ... |
| 296,053 | 1 | ,, | 1/7½ | 17/67½[d] | Do. 8 p.c. Pref. | 17/6—19/6[e] | ... | ... |
| 2,073,280 | Stk. | Feb. 19 | 6 | 6 | Commercia Ord. ... ... | 93—96 | ... | ... |
| 475,000 | ,, | Dec. 18 | 3 | 3 | Do. 3 p.c. Deb. ... | 57—60 | ... | 57½—58½ |
| 787,560 | ,, | Feb. 19 | 7 | 7 | Croydon sliding scale ... | 107—110 | ... | 109½—110⅝ |
| 453,100 | ,, | ,, | 5 | 5 | Do. max. div. ... ... | 82—85 | ... | ... |
| 542,270 | ,, | Mar. 5 | 7 | 10 | Derby Con. ... ... ... | 120—123[e] | ... | ... |
| 55,000 | ,, | Dec. 18 | 4 | 4 | Do. Deb. ... ... ... | 65—70[e] | ... | ... |
| 209,000 | ,, | Mar. 5 | 5 | 5 | East Hull Ord. 5 p.c. ... | 72—75 | ... | ... |
| 1,002,180 | ,, | Mar. 19 | †4 | †6½ | European, Ltd. ... ... ... | 92—97 | −1 | 92—96½ |
| 18,953,033 | ,, | Feb. 19 | 5⅜ | 5⅜ | Gas Light & Coke 4 p.c. Ord. | 18/—19/-[f] | ... | 18/1½—18/9 |
| 2,600,000 | ,, | ,, | 3½ | 3½ | Do. 3½ p.c. max. ... ... | 63—66 | ... | 64½—65 |
| 4,294,691 | ,, | ,, | 4 | 4 | Do. 4 p.c. Con. Pref. ... | 78—81 | ... | 79½—80½ |
| 5,604,095 | ,, | Dec. 18 | 3 | 3 | Do. 3 p.c. Con. Deb. ... | 60—63 | ... | 61—63 |
| 3,642,770 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 100—103 | ... | 102—103 |
| 2,500,000 | ,, | ,, | — | — | Do. 4½ p.c. Red. Deb. ... | 95—97 | ... | 96⅝—96½ |
| 161,480 | ,, | Mar. 5 | 10 | 10 | Harrogate Cons. 10 p.c. max. | 158—163 | ... | ... |
| 82,500 | ,, | Mar. 19 | 7 | 7 | Hastings & St. L. 5 p.c. Conv. | 98—103 | ... | ... |
| 258,740 | ,, | ,, | 5½ | 5½ | Do. 3½ p.c. Conv. | 82—85 | ... | ... |
| 70,000 | 10 | Oct. 9 | 8 | 10 | Hongkong & China, Ltd. ... | 13—14 | ... | ... |
| 213,200 | Stk. | Mar. 5 | 6 | 6 | Hornsey Con. 3½ p.c. ... | 91—94 | +2 | 93—93½ |
| 2,436,594 | ,, | Nov. 6 | 25 | 15 | Imperial Continental Cap. | 355—375 | −5 | 363—372 |
| 223,130 | ,, | Feb. 5 | 3½ | 3½ | Do. 3½ p.c. Red. Deb. | 78—83 | ... | ... |
| 235,242 | ,, | Mar. 5 | 8½ | 8½ | Lea Bridge 5 p.c. Ord. ... | 127—130 | ... | ... |
| 2,145,907 | ,, | Feb. 19 | 6 | 6 | Liverpool 5 p.c. Ord. ... | 98⅝—99⅜[b] | +½ | ... |
| 600,000 | ,, | Mar. 19 | 7 | 7 | Do. 7 p.c. Red. Pref. | 98½—100½[b] | +2 | ... |
| 165,736 | ,, | Feb. 19 | 9 | 9 | Maidstone 5 p.c. Cap. ... | 128—133 | ... | ... |
| 63,480 | ,, | Dec. 18 | 3 | 3 | Do. 3 p.c. Deb. ... | 54—57 | ... | ... |
| 75,000 | 5 | Dec. 4 | †10 | †10 | Malta & Mediterranean ... Metropolitan (of Melbourne) | 6—6½ | ... | ... |
| 392,000 | — | Apl. 2 | 5½ | 5½ | 5½ p.c. Red. Deb. ... ... | 86—89[e] | ... | ... |
| 675,000 | Stk. | Nov. 20 | †8 | †6 | Montevideo, Ltd. ... ... | 95—105 | ... | 97—100 |
| 2,061,315 | ,, | Mar. 5 | 5 | 5⅔ | Newcastle & Gateshead Con. | 16/9—17/6[d] | +/1½ | ... |
| 682,856 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref. ... | 74—75[d] | ... | ... |
| 691,705 | ,, | Jan. 8 | 3½ | 3½ | Do. 3½ p.c. Deb. ... | 67½—68½[d] | ... | ... |
| 277,285 | ,, | Nov. 5 | 5 | 5 | Do. 5 p.c. Red. Deb. | 98—100[d] | ... | ... |
| 199,940 | ,, | Mar. 5 | 7½ | 7½ | North Middlesex 6 p.c. Con. | 115—120 | ... | ... |
| 396,160 | ,, | Feb. 5 | 5 | 5 | Northampton 5 p.c. max. ... | 74—79 | ... | ... |
| 300,000 | ,, | Nov. 20 | 7 | 9 | Oriental, Ltd. ... ... | 100—110 | ... | 107½—108½ |
| 60,000 | 5 | 13 May, '15 | — | — | Ottoman ... ... ... | 0—½ | ... | ... |
| 205,162 | Stk. | Dec. 18 | 8 | 8 | Plym'th & Stonehouse 5 p.c. | 110—115 | ... | ... |
| 424,416 | ,, | Feb. 19 | 8 | 8 | Portsm'th Con.Stk. 4 p.c.Std. | 122—127 | ... | 125—126 |
| 241,446 | ,, | ,, | 5 | 5 | Do. 5 p.c. max. ... | 78—81 | ... | ... |
| 686,312 | ,, | Jan. 22 | 4 | 4 | Primitiva 4 p.c. Rd. Db. 1911 | 84—87 | ... | ... |
| 389,813 | ,, | Dec. 18 | 4 | 4 | Do. 4 p.c. Cons. Deb. | 84—87 | ... | 86 |
| 150,000 | 10 | Apl. 9 | 6 | 6 | San Paulo 6 p.c. Pref. ... | 8—8½[e] | ... | ... |
| 1,736,968 | Stk. | Mar. 19 | 6½ | 6½ | Sheffield Cons. ... ... | 102½—104½[e] | ... | ... |
| 95,000 | ,, | Jan. 8 | 4 | 4 | Do. 4 p.c. Deb. ... ... | 78—80[e] | ... | ... |
| 90,000 | 10 | June 5 | †4 | †5 | South African ... ... | 4—6 | ... | ... |
| 6,709,895 | Stk. | Feb. 5 | 5 | 7½ | South Met. Ord. ... ... | 103—106 | ... | 102⅞—104½ |
| 1,135,812 | ,, | ,, | 6 | 6 | Do. 6 p.c. Irred. Pf. | 112—115 | ... | 114½ |
| 1,895,445 | ,, | Jan. 8 | 3 | 3 | Do. 3 p.c. Deb. ... | 60—63 | ... | 61 |
| 734,000 | ,, | Mar. 5 | 6½ | 6½ | Do. 6½ p.c. Red. Db. | 98—100 | ... | ... |
| 1,000,000 | ,, | Jan. 22 | — | 4 | Do. 5 p.c. Red. Deb. | 100—103 | ... | 102½—103 |
| 91,500 | ,, | Mar. 5 | 8½ | 8½ | South Shields Con. ... ... | 107—109[d] | ... | ... |
| 1,543,795 | ,, | Feb. 19 | 6½ | 6½ | South Suburban Ord. 5 p.c. | 102—105 | ... | 104 |
| 668,837 | ,, | Dec. 18 | 5 | 5 | Do. 5 p.c. Deb. | 100—103 | ... | 102 |
| 647,740 | ,, | Feb. 19 | 5 | 5 | Southampt'n Ord. 5 p.c. max. | 77—80 | ... | ... |
| 121,275 | ,, | Dec. 18 | 4 | 4 | Do. 4 p.c. Deb. | 75—78 | ... | ... |
| 179,014 | ,, | Mar. 5 | 8 | 8 | Sutton Ord. ... ... ... | 120—130 | ... | ... |
| 94,500 | ,, | Jan. 8 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 96—99 | ... | ... |
| 250,000 | ,, | Mar. 5 | 7 | 7 | Swansea 7 p.c. Red. Pref. ... | 96—99 | ... | ... |
| 200,000 | ,, | Dec. 18 | 6½ | 6½ | Do. 6½ p.c. Red. Deb. | 100—103 | ... | ... |
| 1,076,490 | ,, | Mar. 5 | 6⅝ | 6⅝ | Tottenham District Ord. ... | 102—106 | ... | 105½ |
| 150,000 | ,, | ,, | 5½ | 5½ | Do. 5½ p.c. Pref. ... | 101—104 | ... | ... |
| 199,005 | ,, | Dec. 18 | 4 | 4 | Do. 4 p.c. Deb. ... | 77—80 | ... | ... |
| 85,701 | ,, | Mar. 19 | 6 | 6 | Tuscan, Ltd., 6 p.c. Red. Db. | 74—79 | ... | ... |
| 310,694 | ,, | Mar. 5 | 7 | 7 | Uxbridge, Maidenhead, & Wycombe 5 p.c. ... ... | 102—107 | ... | 106½ |
| 88,330 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... | 88—93 | ... | ... |
| 1,322,220 | ,, | Mar. 5 | 7 | 7 | Wandsworth, Wimbledon, and Epsom Cons. ... | 111—114 | +1 | 113—114 |
| 426,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 95—98 | ... | ... |
| 1,013,464 | ,, | Dec. 18 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 100—103 | ... | 101 |

Quotations at :—*a*.—Bristol. *b*.—Liverpool. *c*.—Nottingham. *d*.—Newcastle. *e*.—Sheffield. *f*.—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Div. = 10 p.ct. p.a. less tax and less tax on interim dividend.

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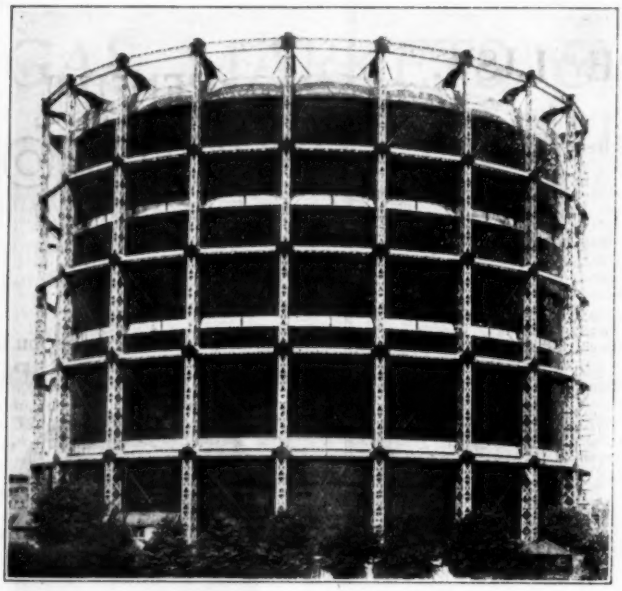

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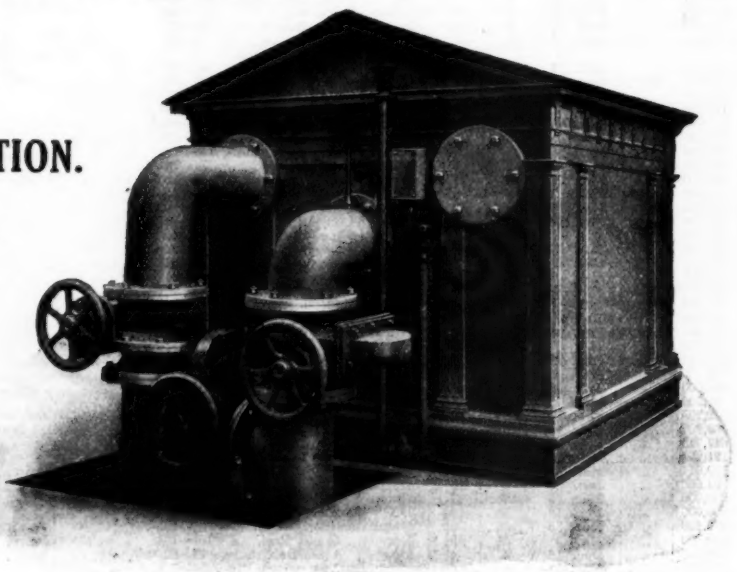

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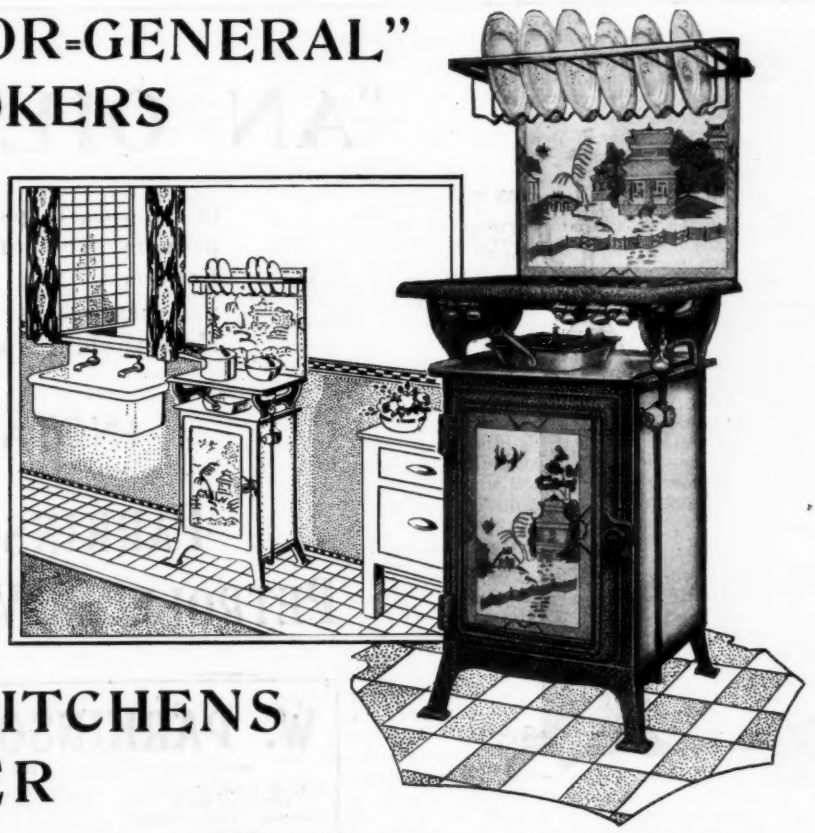

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